Tokenizing Assets on a Blockchain

Blockchain for Life Sciences

James Canterbury
Ernst & Young LLP

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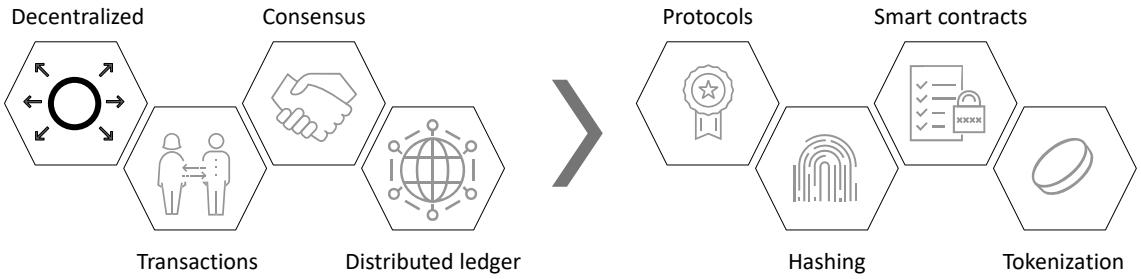
Blockchain core concepts

The non-technical version …

Blockchain is a **distributed ledger technology** — it maintains an ordered list of transactions that occur between members of a **network** which enables a **decentralized** ledger of trusted data — a **shared record book**



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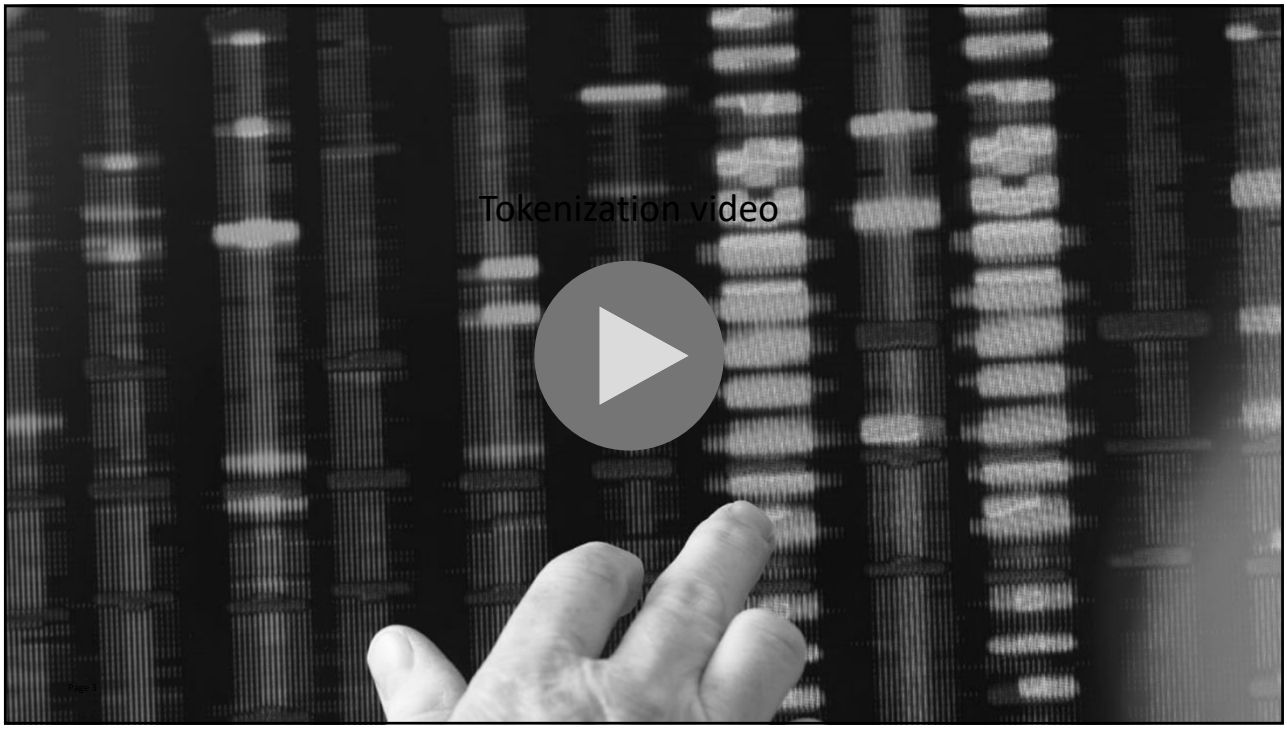

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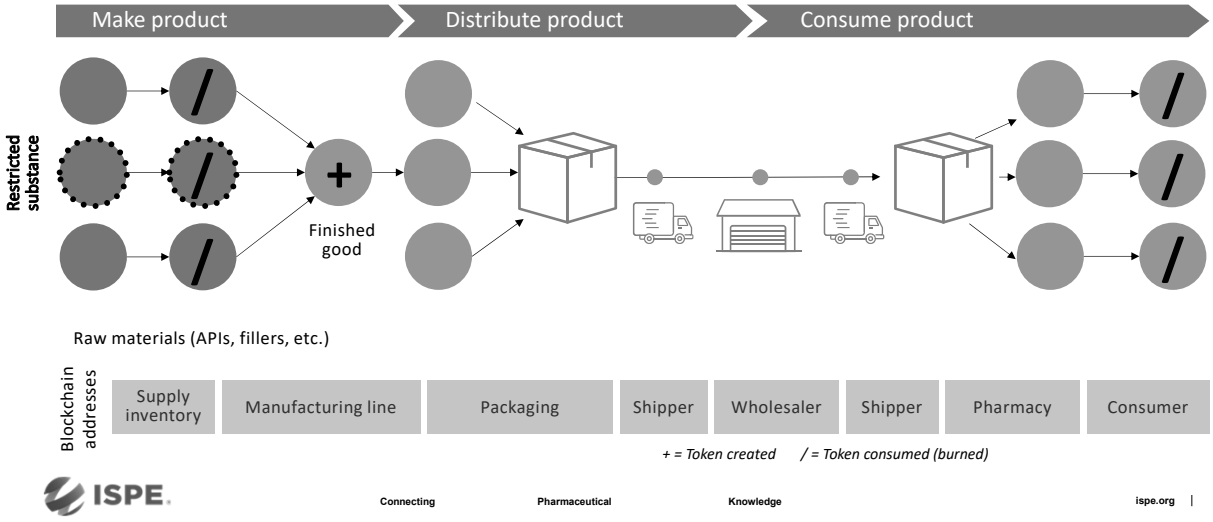
Tracking tokenized assets on the blockchain

Creating transparency into the supply chain for drugs and devices

Example of a token strategy design



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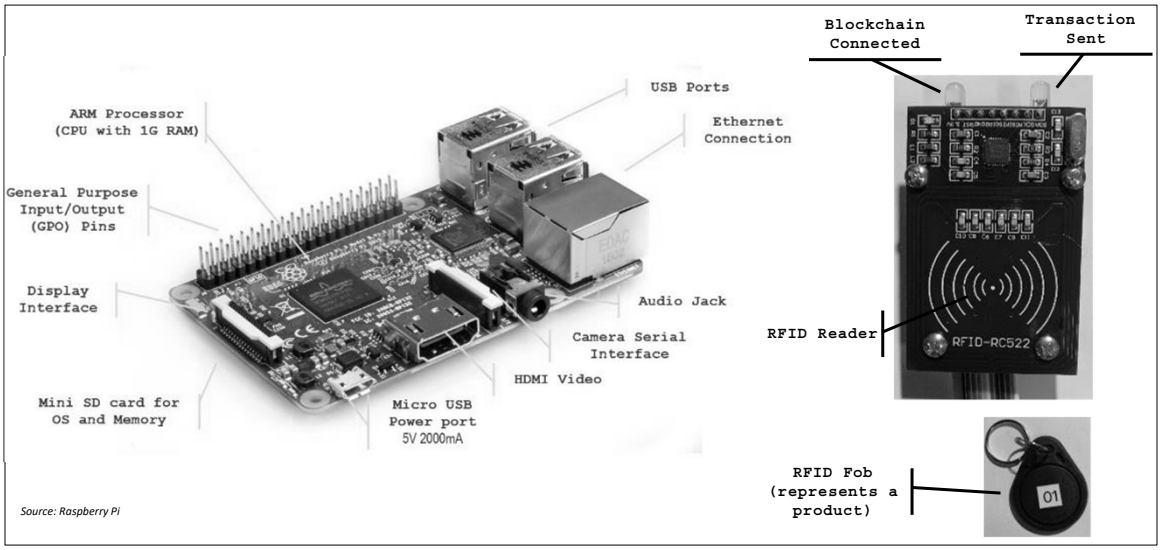
Demo equipment: anatomy of a Raspberry Pi 3B



Raspberry Pi demo

Some technical stuff

- Spin up a fresh Ethereum Proof of Authority (PoA) network
  - **Create a 3-node cluster on the Macintosh**
  - **Create participant nodes on Raspberry Pi A, B and C**
  - **Unlock all of the accounts (relax this is only a demo …)**
- Deploy the openzeppelin ERC-721 contract
  - **Sync the contract address to the Raspberry Pis**
- Mint 10 non-fungible tokens to represent products assigned to predefined RFIDs
- Approve Raspberry Pi accounts to receive the tokens
- Transfer the 10 tokens to Raspberry Pi A
- Trigger the transferFrom () function of ERC-721 when an RFID token is scanned by a Raspberry Pi
- See what happens …

Common use case categories

Notary systems:
Using the blockchain to notarize digital documents allowing the user to "prove" that a document/data existed at a specific point in time in the past

Examples:

Capturing consent:
Combining digital identity with transactions that document someone giving or revoking consent

Certifications:
Signed certificates from reputable sources (e.g., college degrees)

Value exchange:
Using tokens to represent value and exchanging those tokens between parties using blockchain as the common source of truth

Examples:

Cryptocurrencies:
Creating programmable money that is used to settle accounts between parties

Tokenized assets:
Representing physical assets on a blockchain and tracking their movements via smart contracts and transactions

Not-yet-common life sciences use cases

Token curated registries (TCRs):
Using a public blockchain to maintain an accurate list of public information with a cryptocurrency incentive to correct errors (e.g., shipping addresses or public contact info)

Decentralized autonomous organizations (DAOs):
Leveraging a voting system in conjunction with a prediction market to facilitate scalable — yet resilient — collective decision- making

Do you need a blockchain for that?

We have a five-point test for viability

1. **Are there multiple parties in this ecosystem?**
   Blockchains get more secure with more parties in the network. One-participant networks are not especially secure.
2. **Is establishing trust between all the parties an issue? Or disparate data systems feeding shared info?**
   Blockchains improve trust between participants by having multiple points of verification and can work on data fed from disparate systems.
3. **Are we securing the ownership or management of a finite resource?**
   Core logic in the system is designed to prevent double counting of assets and record ownership and transfers.
4. **Do all the parties need to work with shared, complex business logic?**
   Smart contracts can handle very complex logic and be customized for each relationship.
5. **Does this ecosystem benefit from improved transparency?**
   Data shared on a blockchain is public to all network participants.
   Future encryption methods will enable participants to verify data accuracy without viewing transaction details.

Use Cases from 2019 ISPE Annual Meeting

The MediLedger Project

Merck Animal Health Pilot

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Blockchain is Happening - Now

- DCSA 2019: Problem Statement
  - 60M units returns every year
  - 800+ licensed manufacturers
  - 100+ wholesalers
  - 15+ solution providers managing serial numbers on behalf of manufacturers
  - Operational expectation to get verification response in **less than 1 second**
- Key dates
  - MediLedger Network goes live: November 15th
  - Decentralized, run by the industry or solution providers they choose

Sample of Key MediLedger Node Hosts

CardinalHealth, SAP, OPTEL, SYSTECH, FFF enterprises, tracekey

Greater than 90% of all drugs resold in the US will be verified via the MediLedger Network

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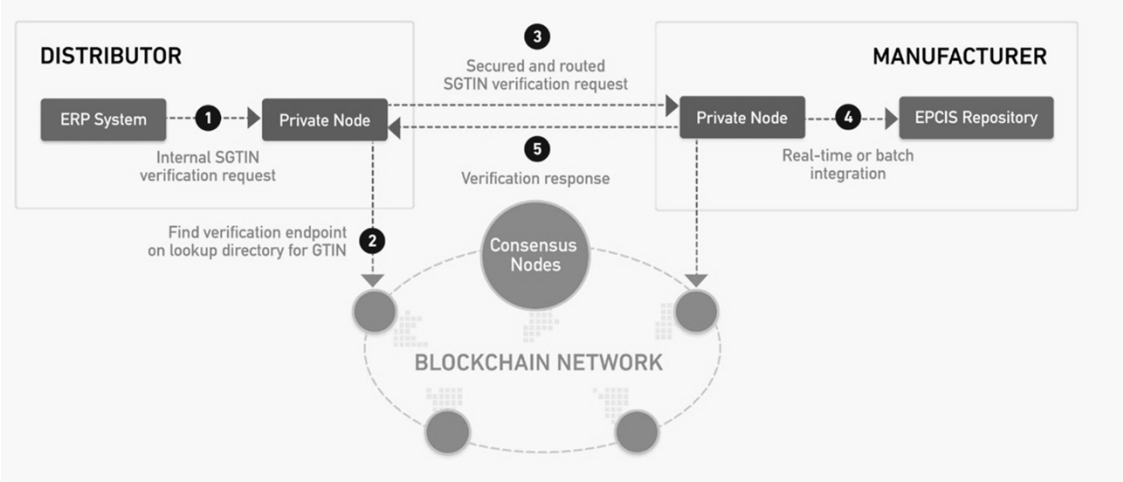
Product Verification System (PVS) for Saleable Returns



https://www.mediledger.com/solution-protocols

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Merck Animal Health – Product Visibility
Proof of Concept Readout

Video

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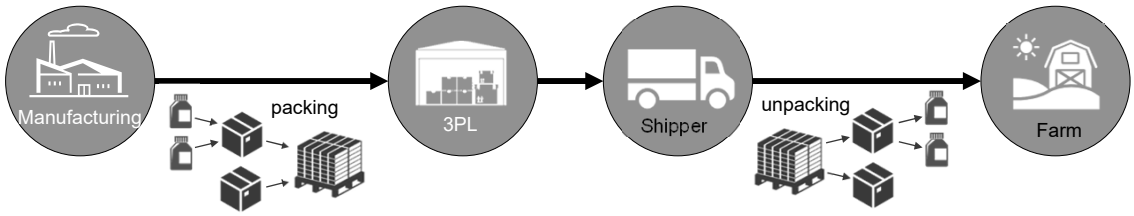
From Proof of Concept to Pilot (on-going)

To explore the POC more we partnered with one of our customers to track the movement of MAH product they ordered in parallel with current production systems.



Using Non-fungible (ERC-721) tokens we are able to track the movements of inventory through distribution channels without integrating all of the systems along the way.

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Wrap-Up

"an 'a' with a ring around it"
Comments on blockchain maturity

Clip from 1994 Today Show explaining the internet …

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