Qlip created a Blockchain for raw milk

Why?
- It is supposed to be the greatest invention since the internet?
- But what is it really?
  - Can we trust this / what is the plateau of productivity?
So, what did we learn? (spoiler alert!)

- Blockchain technology can really add value to:
  - Traceability issues
  - And create new possibilities for cooperation
- And that it is safe to trust your data to this technology:
  - And even the other way round: Your data will be trusted more when you use this technology.

But the most important thing for today is:

It's important to invest in knowledge about blockchain technology:
Especially for decision / policy makers:
  - To really understand where this value and trust comes from.
  - To keep expectations realistic (prevent the hype).
Knowledge: my personal eye-openers*

- The difference between a centralized database vs a distributed database
- How “Hashing” is used and how does it help to secure a Blockchain
- How to interpret “complete transparency”
- How about energy consumption
- How about cryptocurrencies.

*) Disclaimer!:
My explanations are in the eyes of blockchain purists probably over-simplified, but I have experienced that it helps a lot understanding the blockchain (and the value it can bring).
Sharing information: central database

- When you use a central database to cooperate between different companies, there is *always* a controller who has access to everything.
  - This controller could query (for instance) the amount of milk that each company delivers and thus gain extra knowledge of the market.
- Also: the controller has the opportunity to alter data without anyone noticing it.
  - He/She is the boss of all the data

→ This “feature” prevents some companies from data sharing / working together.
Sharing information in a Blockchain

• Every participant of the blockchain has his own copy of the database.
• There is no controller, direct access to the database is impossible. You can only access it through the blockchain-application.
• All data is encrypted: you can only see the data that you are allowed to see.
• Even if someone manages to get direct access (very unlikely): and he changes a record (unlikely because of encryption): the other copies will notice that immediately.

→ There is no “boss” who owns all the data. → you can cooperate without the danger of one person being able to access all the data.
Noticing data manipulation with “Hashing” (1/2)

• Mathematical calculation that creates a unique “fingerprint” of ANY data.
  • If you put the word “ICAR” in a hash-machine you will get the digital fingerprint “85f7e2c16cf515250cb62b5710c376f5 “
  • If you put the word “ICAr” in a hash-machine you will get the digital fingerprint “1ff87468d3621a6a6b65288b99c42d54 “
  • You can hash any kind of data: an encyclopedia on pdf, a movie, a milk collection record etc.

→ Even the smallest change in the data, gives a totally other Hash.
Data elements that are stored on the blockchain have a hash of all previous data elements in them.

Illegal data manipulation is impossible without “breaking the chain”.
  - It is technological **impossible** to re-calculate all new hashes in all nodes simultaneously.

The Blockchain monitors this constantly.
Misconceptions about Blockchain (1)

“Complete transparency”

• If this was true, no one would participate in a blockchain (from a supply chain perspective). You don’t want to share everything with everybody!
• In modern *3rd generation block chains (i.e. Hyperledger) you will be completely transparent with the companies who are part of the transaction.
• For example: In our dairy blockchain: you can see all the details of the milk delivery (completely transparent) if:
  • You own the milk, or
  • If you have received the milk, or
  • if you have “put“ the “milkrecord” on the blockchain. (the Oracle).
Misconceptions about Blockchain (2)

Blockchain = High Energy consumption

This is not true for blockchain in general:

• Bitcoin uses a very high energy consuming “Consensus Algorithm”. At this moment the Bitcoin network alone consumes more electrical power than the country of Sweden. This is unethical high (my personal opinion) and unacceptable for a sustainable dairy production chain.

• Third generation blockchain protocols (like Hyperledger Fabric) have solved this with other consensus algorithms.
Misconceptions about Blockchain (3)

Blockchain = Cryptocurrencies

- Blockchain is a technology, Bitcoin is a protocol. There are 1000 of different protocols right now based on Blockchain technology.
- We use Hyperledger Fabric: a protocol especially suited for supply chains that has nothing to do with the (hysterical) Bitcoin.
  - Totally different worlds.
  - Permissioned (you know who the players are that are involved).
Example how blockchain can improve cooperation: The Maersk case

- Administration costs reduced with 80%
- Shipping time reduced by 40% (less waiting)
- Improved information “Where is my container” can directly be answered (used to take 1 week to answer)
Example how Blockchain improves tracking & tracing

• Consumers can scan a QR code on the end product. (examples from table eggs & Orange juice)

• But also opportunities for semi-finished products.
Our Business case

• 17% of all milk collections are unloaded at a different dairy company then where the farmer is connected to.

• Information about these collections are shared by mail and not always complete or detailed as could be. It is a large administrative operation.

• We wanted to create a single point of truth, with the benefits of blockchain technology, where every mutation is visible.

• Minimal Viable Product Strategy.
...Minimal Viable Product....

- Feels like a very small & simple application
- But technologically *State of the art (Hyperledger Fabric)*
- Huge potential “under the hood”
Search milk collections

Authorization:
- Owner
- Recipient
- Oracle

Mutations shown as

Filter options in top of screen
Details of milk collection (farmer level)

In orange: mutations are highlighted. In this case an adjustment in volume (problem on the milk collection truck).

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DairyBlockchain

In orange: mutations are highlighted. In this case an adjustment in volume (problem on the milk collection truck).
Most interesting: mutation of milk in "the Milk administration program!"

• From “normal/regular milk” to “meadow milk” → here is where everybody sees the true value of the Blockchain.

In orange: the type of milk is altered by a dairy company from 10 (regular milk) to 33 (meadow milk).

(after investigation: This correction was not fraudulent, but it demonstrates exactly the power of the blockchain)
What did we learn

• Better understanding of Blockchain technology and the value it can bring.

• Convinced that it is a safe way to cooperate / share data.

• Very happy with our choice of Hyperledger Fabric
  • Great performance / installed base is big and growing / modern tool / fit for the future.

• Due to MVP approach: improvements are planned on:
  • Authentication
  • Deployment of new nodes
  • Key management system
Plans for the future

• Connect all other dairy companies to the Dairy Blockchain with respect to raw milk collections.

• Create a governance structure for the dairy blockchain:
  • My hope: the Dairy Blockchain will evolve in a new part of the dairy infrastructure of the Netherlands: governed by the Dutch dairy companies

• Connect individual production data from Dairy companies to enable full tracking & tracing of end products. (for those who are interested)
Opportunities for the Dutch dairy blockchain

• Lower inspection costs (all data is available in the blockchain)
• Lower administrative costs when buying or exchanging milk.
• With QR code absolute proof that
  • product is produced from Dutch milk or
  • Produced from milk from a specific region or
  • Produced from VLOG milk
  • Etc.

It is the ultimate “do good and tell it” tool.
Questions?

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