analytical · reliable · proficient ·

Blockchain for the Dutch dairy industry

Obscurity → Trust → Opportunity

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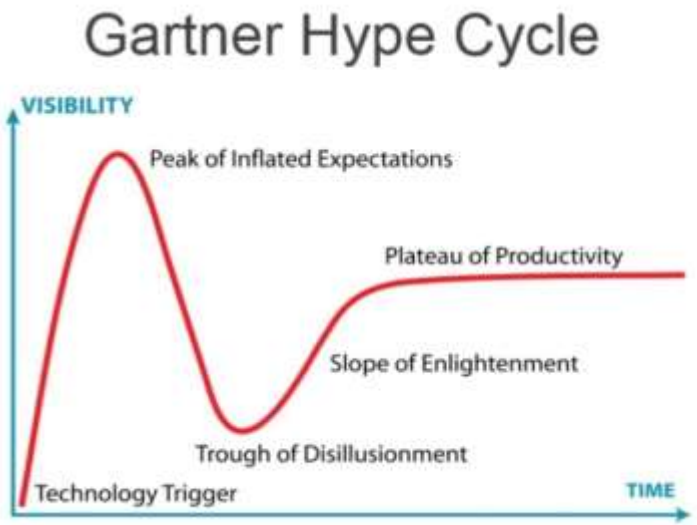
Qlip created a Blockchain for raw milk



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?

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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:

Its 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).

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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).

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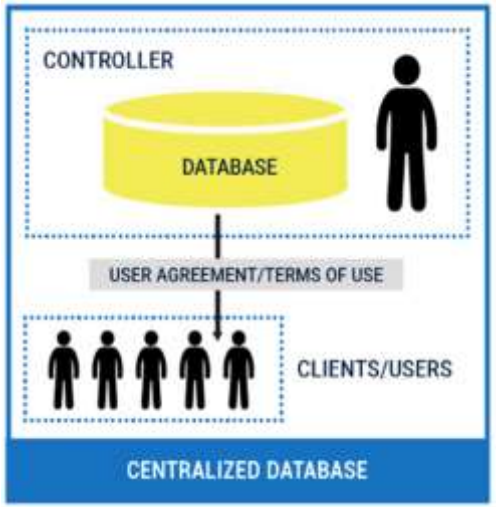
Sharing information:central database

- 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.

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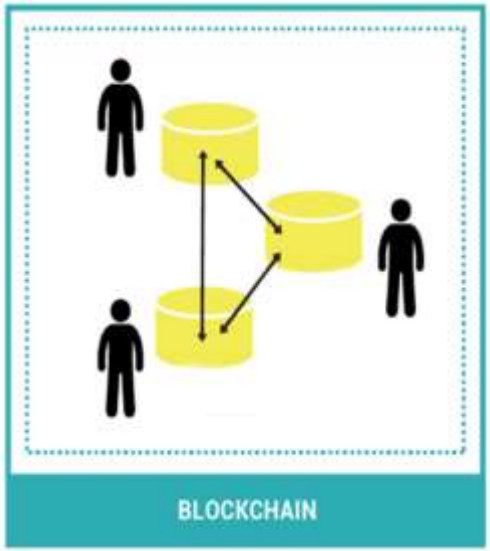
Sharing information in a Blockchain

- 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 beeing able to access all the data.

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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.

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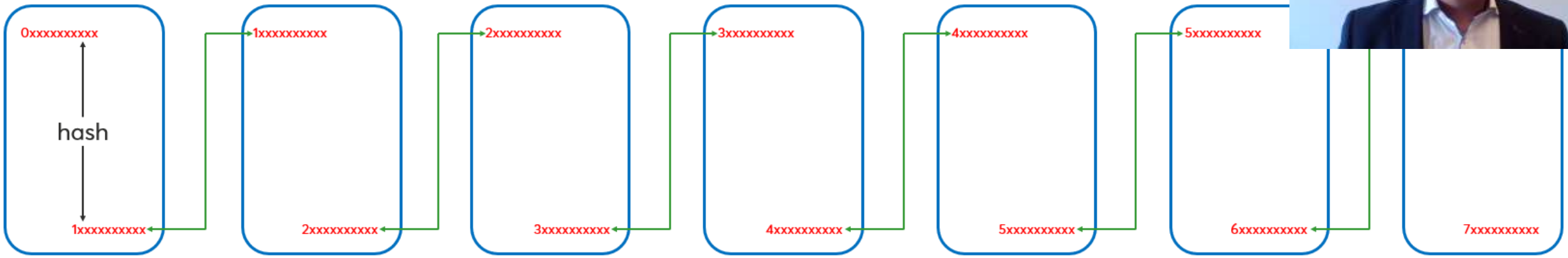
Hashing (2/2)



- 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.

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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).

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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.

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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).

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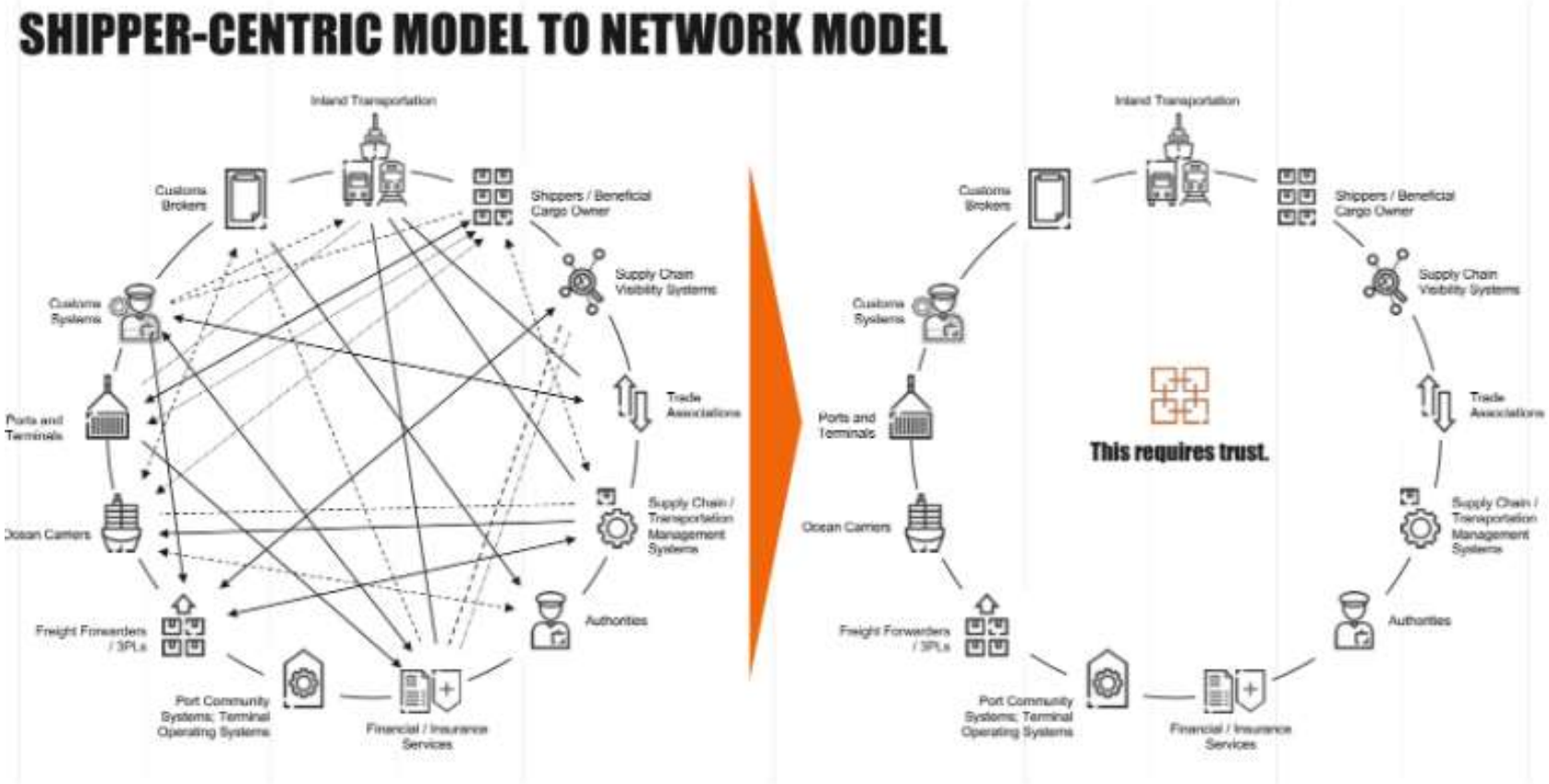
Example how blockchain can improve cooperation: The Maersk case



- 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)

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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.

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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.

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…Minimal Viable Product….

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

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Search milk collections

DairyBlockchain

Ritten | Logout | BCQLIP

Filter

Leverancier: Alle | Ontvangende Fabriek: Alle | Losplaats: Alle | Startdatum: 29-3-2020 | Einddatum: 29-3-2020 | Alleen mutaties

Details	Dag	Begin Rit	Einde Rit	RMO	Volgnr	Verzender	Ontvanger	Begin Lossing	Losplaats	Lossing (L)	Lossing (Kg)	Opdrachtgever	Chauffeur	VCC	Melksoort	Vet (Kg)	Eiwit (Kg)	Lacto
ⓘ	zo	29-03 07:31	29-03 13:01	379	17	034	058	29-03 13:01	0080	28.365	29.273	34	34027	34	33	1.371,785	1.034,44	1.31
ⓘ	zo	29-03 20:05	29-03 23:29	368	7	034	058	29-03 23:29	0080	29.594	30.541	34	5105	34	33	1.415,884	1.054,62	1.36
ⓘ	zo	29-03 11:07	29-03 12:47	879	10	058	058	29-03 12:47	0080	30.028	30.959	58	515304	58	36	1.357,5	1.078,337	1.41
ⓘ	zo	29-03 10:21	29-03 13:13	605	11	058	086	29-03 13:13	0086	28.748	29.639	86	865745	86	36	1.269,389	1.037,362	1.35
ⓘ	zo	29-03 12:26	29-03 14:25	608	12	058	086	29-03 14:25	0086	4.947	5.100	86	865703	86	36	219,296	182,066	23
ⓘ	zo	29-03 16:57	29-03 19:19	881	13	058	058	29-03 19:19	0080	32.091	33.086	58	580126	58	36	1.504,062	1.186,735	1.5
ⓘ	zo	29-03 16:27	29-03 19:08	875	14	058	058	29-03 19:08	0071	31.811	32.797	58	580159	58	10	1.326,649	1.124,944	1.51
ⓘ	zo	29-03 18:10	29-03 20:21	883	15	058	058	29-03 20:21	0080	33.447	34.484	58	580115	58	36	1.605,541	1.259,292	1.56
ⓘ	zo	29-03 17:05	29-03 21:21	849	16	058	058	29-03 21:21	0080	33.404	34.440	58	580011	58	36	1.578,224	1.198,494	1.55
ⓘ	zo	29-03 17:08	29-03 21:17	851	17	058	058	29-03 21:17	0071	35.141	36.230	58	580081	58	33	1.667,078	1.304,718	1.65

50 | 1 2 3 4 5

Authorization:
- Owner
- Recipient
- Oracle

Mutations shown as ⓘ

Filter options in top of screen

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Details of milk collection (farmer level)

DairyBlockchain | Ritten | Logout | BCQLIP

Huidige Rit

BC-Stempel	Dag	Begin Rit	Einde Rit	RMO	Volgnr	Verzender	Ontvanger	Begin Lossing	Losplaats	Lossing (L)	Lossing (Kg)	Opdrachtgever	Chauffeur	VCC
11-04 13:02	ma	06-04 09:57	06-04 12:59	869	41	058	029	06-04 12:59	0216	33.731	34.810	58	580087	58

Innames

Historie	BC-Stempel	Inname	FTN	Melk (Kg)	Melk (L)	Temperatuur	Bact. Gr.	Kiemgetal	Reinheid	Boterzuur	Celgetal	Geo. Celgetal	Zuurtegraad vet	Vriespunt	Chloroform
	11-04 13:02	06-04 09:58	9057	11.500	11.143	5,2	-	11	geen vuil	--	111	107	0,2	0.526-	
	11-04 13:02	06-04 10:43	4326	5.088	4.930	3,8	-	7	geen vuil		167	183	0,2	0.521-	
	11-04 13:02	06-04 10:56	4036	1.489	1.443	3,4	-	8	geen vuil	--	339	231	0,4	0.516-	
	11-04 13:02	06-04 11:03	4020	4.544	4.404	4	-	3	geen vuil	--			0,6	0.523-	
ⓘ	11-04 13:02	06-04 11:13	2316	3.980	3.857	4,3	-	11	geen vuil	--	166	174	0,3	0.517-	
	06-04 15:04	06-04 11:13	2316	3.980	3.857	4,3									
	06-04 13:04	06-04 11:13	2316	6.200	6.008	4,3									
	11-04 13:02	06-04 11:33	4694	5.989	5.803	3,6	-	9	geen vuil	--	198	200	0,2	0.514-	
	11-04 13:02	06-04 11:23	4037	2.220	2.151	4,3									

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

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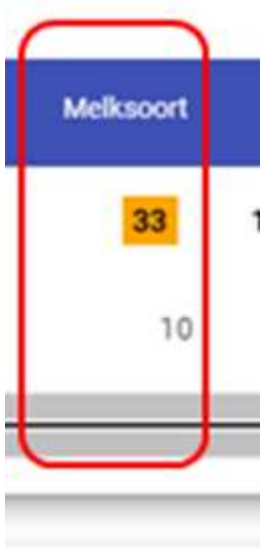
Most interesting: mutation of milk in `the Milk administration program!

- 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)

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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

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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)

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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.

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Questions?

Or mail Floris Ruiterkamp

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