Applying blockchain to ease and digitise the exchange of pallets

Dr. Ralph Tröger | GS1 Germany
GS1 Innovation Café | Leuven | 2019-06-05
Lumos! Expelliarmus! Blockchain!

Some people consider Blockchain to be the magic wand to get rid of all of our problems...

...really? We wanted to take a closer look if this is true.
Our use case? A real business issue

Pallet exchange at the loading bay

- There are more than 500 million Euro pallets in circulation in Europe, worth at least 2.5 billion euros.

- Around five cycles per year and cycle costs of roughly €3.80 per pallet. Total process costs: approx. €9.5 billion.
- Around a quarter of these costs are administrative.

- Complex, with a lack of transparency: no intermediary, users rarely know each other.

Pallet notes in the exchange process

- Major optimisation potential compared to other processes in the supply chain.

An average of 30 pallets are listed on one pallet note. Total: 150 million transactions to record per year...

... Two account systems for two exchange partners doubles this to 300 million transactions.

Lack of standardisation and digitalisation in the pallet exchange system.
Project goals

- **Test blockchain technology** taking the example of the pallet exchange process
- **Digitise** the **pallet note**
- **Create** an exemplary network of trading partners exchanging pallets
- **Conduct** a **realistic trial**
- **Qualitative benefit analysis**
- **Gain** and **transfer knowledge**
Facts and figures

- Participants: 35
- Exchange parties: 17
- Locations: 20
- BC nodes: 11
- Project duration: 12 months
- Protocol: MultiChain
- Transactions: 543 in field test
- Transactions: 116,665 in load test
Project participants
Solution approach illustration

Pallet exchange process

Exchange party A

Exchange party B

Mobile app

IT infrastructure

blockchain nodes

Sender

Forwarder

Recipient

Back office web portal

Forwarder
Look and feel
How did GS1 standards help?

PoC solution sketch for the digitised pallet exchange in a consortium blockchain

Application systems (here e.g. inventory control, ERP)

Standardised IDs, attributes, APIs, data models (here: GLN, GRAI, GDTI, EPCIS/CBV)

Data sharing technology (here: Blockchain)

Unload  Load
Invoice settlement  Correction

Pallet exchange business processes

EPCIS events

Capture  Query
# Blockchain transactions

## Pallet exchange transaction (simplified)

<table>
<thead>
<tr>
<th>EPCIS Event</th>
<th>Object Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error Declaration (optional)</td>
<td>Date, time and reason of an error declaration, e.g. Nov 2\textsuperscript{nd} 2018, 16:15, incorrect data</td>
</tr>
<tr>
<td>WHEN</td>
<td>Date and time of event, e.g. Nov 2\textsuperscript{nd} 2018, 14:30</td>
</tr>
<tr>
<td>WHAT</td>
<td>Number of full or empty pallets, identified by a GRAI</td>
</tr>
<tr>
<td>WHERE</td>
<td>GLN identifying the location of where an exchange of pallets took place</td>
</tr>
</tbody>
</table>
| WHY | • Business process step (e.g. “arriving”)  
• GDTI identifying pallet exchange transaction  
• GLN identifying submitting/receiving party |
| Extensions | (optional) License plate  
(optional) Exchange omission reason (e.g. “no pool pallets available”) |
Master data transaction for a given GLN (simplified)

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocabulary Type</td>
<td>“SourceDestination” (for parties)</td>
</tr>
<tr>
<td>Name</td>
<td>Name of the party/location</td>
</tr>
<tr>
<td>Street Address One</td>
<td>Street and street number</td>
</tr>
<tr>
<td>City</td>
<td>City</td>
</tr>
<tr>
<td>Postal Code</td>
<td>Postal code</td>
</tr>
<tr>
<td>Country Code</td>
<td>Country code (ISO 3166-1 Alpha-2-Code)</td>
</tr>
</tbody>
</table>

Based on EPCIS master data document
Blockchain-based pallet accounting

Consistent, reliable and transparent data base

<table>
<thead>
<tr>
<th>#</th>
<th>GDTI</th>
<th>Time</th>
<th>Business Step</th>
<th>Quantity</th>
<th>Error Declaration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>Oct 1\textsuperscript{st} 2018, 15:00</td>
<td>Departing</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>Oct 2\textsuperscript{nd} 2018, 09:30</td>
<td>Departing</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>Oct 3\textsuperscript{rd} 2018, 14:30</td>
<td>Departing</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>D</td>
<td>Oct 4\textsuperscript{th} 2018, 17:45</td>
<td>Departing</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>E</td>
<td>Oct 5\textsuperscript{th} 2018, 14:30</td>
<td>Departing</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Oct 6\textsuperscript{th} 2018, 11:15</td>
<td>Accepting</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>C</td>
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<td>20</td>
<td>Error Declaration for #3</td>
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<tr>
<td>8</td>
<td>C</td>
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<td>Departing</td>
<td>15</td>
<td>Correction</td>
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<tr>
<td>9</td>
<td>F</td>
<td>Oct 6\textsuperscript{th} 2018, 14:55</td>
<td>Departing</td>
<td>27</td>
<td></td>
</tr>
</tbody>
</table>
Key learnings

- Blockchain is **no plug and play**
- **Using established systems** (e.g. GS1 IDs, EPCIS data model) **reduces project duration** significantly
- **Establishing a business partner network** is **quite challenging**
- **Transparency** is **both blessing and curse**
- Blockchain **needs a change in people’s mindset**
- **Bumps wait where you expect them the least** (e.g. connectivity issues due to mobile network gaps or shielding ceilings/walls)
Coming back to our initial statement...

Unfortunately, Blockchain is NOT the magic wand....

...at the same time, it is a promising technology – IF(!) it fits the underlying use case
Next steps

• Many participating organisations indicated their **interest to continue this initiative** and help in **paving the way for a productive solution**
• This opens a number of **exciting further learning opportunities**, e.g.:
  - the development of a ‘code of conduct’ (including membership management, voting procedures, handling of malpractice, etc.)
  - refinement of the data sharing concept (on-chain vs. off-chain)
  - identity management
  - the application of smart contracts
  - and much more

**Interested in joining us?**
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All facts, insights, and learnings at your fingertips!

Putting blockchain to the test

Key findings from Germany’s largest cross-company pilot project

Process analysis: design thinking led to a collaborative solution

The project resulted in a shared pallet exchange process that was developed by employees from different companies. These companies were using a diverse range of exchange processes, from a “letterbox” solution to a customised extension of the company’s ERP system. The project team managed to employ the right method to arrive at a shared solution.

Governance: reaching a charter for a blockchain consortium

A consortium blockchain network must agree on rules from the outset. A trivial question is “Who can decide what, and when?” A somewhat harder issue is “How should decisions be made?” This could be, for example, a “no-code” or “no-people” decision, i.e. people and committees, versus smart contracts. Which data should be visible to whom? What is allowed, what is not allowed and what do people want? There are many questions and a lot of unknown territory. There’s no point searching for an example of established best practice here.

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(GS1) standards used in the blockchain

Standards range from pallet identification to data exchange in the blockchain. Which key standards did project participants agree upon? How have they actually been integrated in the blockchain solution? What data do blockchain transactions contain? And how can it be used to feed data into the pallet accounts of participating exchange partners?

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