Legally Enforceable Field Automation: Lessons Learned From the Water Hauling Supply Chain
It’s all started 3 years ago with PIDX Field Ticket Workgroup

A paradigm shift, not another e-field ticketing solution

Automating the water hauling order-to-cash process

Legally enforceable automation

Some lessons learned

In conclusion
It all started 3 years ago with the PIDX Field Ticket workgroup.

Unmanned location field ticketing
PIDX field ticket group workshop
18 February 2016

<table>
<thead>
<tr>
<th>Recommended Best Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phase 1:</strong></td>
</tr>
<tr>
<td>Tag all assets (wells, tanks, etc)</td>
</tr>
<tr>
<td>Provide simple devices to field personnel to identify asset and capture light field ticket data (quantities, time)</td>
</tr>
<tr>
<td>Leverage cloud based technology for coding (asset based tag) and approval (portal)</td>
</tr>
<tr>
<td><strong>Phase 2:</strong></td>
</tr>
<tr>
<td>Leverage IoT sensors to automate the process end-to-end</td>
</tr>
</tbody>
</table>

E-field ticket for unmanned locations

Process:
1/ Service request (IoT sensors)
2/ Field ticket (mobile)
3/ Invoice
4/ Payment
A paradigm shift, not another e-field ticketing solution

Data Flow

- Field Data (Sourced from IIoTs or SCADA when Possible) Are Captured in Blockchain
- Orders and Tickets Are Created Via Smart Contracts and Pushed to Trading Partner Workflows
- Invoices Are Captured in Blockchain and Trigger Payments and Associated Trade Financing
- Documentation Can Also Be Generated Via Smart Contracts and Pushed to Regulators
A paradigm shift, not another e-field ticketing solution

- **End-to-end integration from the field to the back-office**
  - Real time flow of field generated data in back-office process and associated systems

- **All participants get access to the same data at the same time**:
  - Distributed ledgers lead to trust between trading partners

- **99% of the field tickets are automatically approved**:
  - No reconciliation- maximum efficiency

- **Payment approval is based on proof of service delivered**:
  - Toward an invoice-less world

- **Service and payment can be completed in few days maybe even the same day**
  - Massively reduced DSO and need for working capital
Automating the water hauling O2C process

**PRODUCER**
- Water Tank
- Historian Database
- Time Series
- IoT Cloud
  - Computed Volume
  - Service Order Smart Contract
  - Field Ticket Smart Contract
  - Hourly Smart Contract
  - Invoice Smart Contract
  - Payment Order Smart Contract
  - Manifest Smart Contract

**SERVICE COMPANY**
- Dispatching
- Measured Volume
- GPS Data
- Field Ticket
- Invoice

**REGULATOR**
- Payment
- Manifest
Legally enforceable automation: the technology to enable it

What it is not:
- A public Blockchain infrastructure based on mining
- An inhouse developed Blockchain protocol
- A crypto currency/ private token based solution

What it is:
- A private permissioned Blockchain leveraging Ethereum with Proof of Authority (PoA)
- A suite of smart contracts allowing full automation of the Procure-to-Pay process
- An Open API leading to easy onboarding of new systems and trading partners
- A flexible enterprise governance mechanism for validation of blocks
- A suite of security services enabling obfuscation of transactions
Example of data captured in blockchain

- Service requests (time when sent, tank level when sent)
- Acknowledgements of job accepted, driver allocated
- Time stamped tank levels for start and end of filling/hauling phases
- Time when crossing geofence (at well or SWD)
- Computed volume hauled, discharged
- Supporting documents (photos of slips, road incidents, etc..)
Lessons learn: it’s all about data

- IoT data quality - Splash effect - Computed volume accuracy
Lessons learned: automation but not only

- Field operations don’t always follow the script
- The solution provides
  - Flexibility in the job scheduling
  - Dispatcher needs to increase the number of loads during the day shift because one driver was not available during the night shift
- Or workarounds in case of Scada data interruption or increase in well flow rate
  - Manual creation of service requests
- On/off connectivity impacts the mobile app performances and needs to be anticipated
  - Syncing, geofencing, etc..
Lessons learned: adoption and system integration

- **Dispatchers:**
  - Almost real time visibility on tank levels, forecast of future SR needed (as predicted by the solution) lead to much better scheduling, the dispatchers love it

- **Truck drivers:**
  - Great adoption of the mobile app
  - Like the idea of having most FT automatically and quickly approved – leading to quicker pay for them

- **Operator IT team**
  - Learning curve in delivering field data to an external system (API)
  - Assessing the cost of transferring massive volume data
In conclusion: it works!

- Full automation of the O2C process for water hauling and any fluid hauling from and to the well can be achieved today
- The integration of IoT/ cloud/ mobile and blockchain appears to be a very viable way to do it
- It creates value both for producers and service companies
  - Objective: reduction of the cost of a single transaction from 80 /100$ to 10/20$
- This technology is built for the shared economy and the full value will be delivered if the adoption is massive and easy
- Easy Onboarding of all participants (big and small) requires
  - Adoption of Standards (PIDX field ticket for ex.)
  - Open API
But more work is needed at the network governance level (OOC consortium)

- **IT**
  - Node participation in a shared network: hosting, certification
  - Validation ability: round robin approach for validation nodes
  - Network growth: adding/ removing participants
  - Islanding and security breaches in a shared network

- **Legal**
  - Legal enforceability of smart contracts among participants, with regulators and auditors
  - SLAs
  - Privacy policy/ NDA to prevent decryption of data inside nodes