THE ROLE OF SMART CONTRACTS IN SMART PRODUCTION
U.S.-German Standards Panel

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Industrie 4.0: „[…] for an equal cooperation between I4.0 components with an open arbitration, a protocol oriented interaction is required […] protocol oriented means: abstraction of the functionality by an automaton […]“:
- asynchronous
- horizontal
- peer-to-peer
- loosely coupled“

source: Bundesministerium für Wirtschaft und Energie ed: Weiterentwicklung des Interaktionsmodells für Industrie 4.0-Komponenten,

blockchains and distributed ledger systems represent a protocol leveraging the following properties:
- trust
- distribution – temporally or spatially
- communication
- (need for reduction of) interfaces
- asynchrony
smart contract:
- distributed code
- representing a process automation
- executed on a blockchain or distributed ledger which,
- once validated and confirmed, results in an outcome
- that is agreed upon by participants in a transaction.
Note 1 to entry: The outcome of a smart contract may or may not primarily intended to be legally binding.

source: working draft definition from TC 307 „Blockchain and Distributed Ledger Systems“ WG1 - Terminology
BC/DLT AS A GENERAL SOLUTION?

- **✓** BC/DLT are able to secure transactions without a trusted central instance
- **✗** BC/DLT require a lot of memory capacity as they do not forget (in their pure sense)
- **✗** BC/DLT consume a lot of bandwidth for communication
- **✗** BC/DLT (may) consume a lot of energy depending on their mining and consensus process

Let’s use BC/DLT – applications where we don’t have better solutions without them

⇒ It’s crucial for the success and acceptance of BC/DLT to find a good use case
WHAT MAKES A USE CASE A GOOD USE CASE?

Use Cases should leverage at least one or more of the basic properties of BC/DLT:

- trust
- distribution – temporally or spatially
- communication
- (reduction of) interfaces
- asynchronity

classification of use cases for smart contracts (45 evaluated)

- supply chain management
- license management
- machine-machine-automation
- energy trading/management
- automated regular contractual transactions
- registry services
- tracking and quality control
The Role of Smart Contracts in Smart Production

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The Role of Smart Contracts in Smart Production
- **license management**
  - authorization to produce goods
  - identity transfer between spare parts
- **supply chain management**
  - product security
  - product delivery and storage
  - extralogistics
    - product tracking
    - counterfeit protection
- **life-cycle-management**
  - production
  - operation
USE CASE 1: SELF-ORGANIZED ADAPTIVE LOGISTICS

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USE CASE 2: ORDER-ENTRY-MANAGED PRODUCTION

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USE-CASE 3: INTEGRATION OF NODE DATA INTO THE BLOCKCHAIN
ADMISSION PROCEDURE, LICENSE MANAGEMENT, …

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Smart Contract

Asset

Verwaltungsschale
Repräsentation d. Informationen
Fachliche Funktionalität

Manifest

Komponenten-Manager

Komponenten-Manager

Asset
CURRENT ACTIVITIES IN STANDARDIZATION …

- ISO TC 307 „Blockchain and distributed ledger systems“ – WG 3 „Smart contracts“
- ITU-T – FG Distributed Ledger Technologies
- Platform Industrie 4.0 – Reference Architecture Model Industrie 4.0 (RAMI)
- OPC-UA – Industrie 4.0 Interface Architecture
- JTC 1/SC 41 – AHG 11 „Industrial Internet of Things“

- not yet consistently covered
  - smart contracts for process automation at all – DIN Spec project only
  - overarching identity mechanisms for distributed identities as required in distributed processes
  - data protection, hiding- and roll-back mechanisms
  - …
• if BC/DLT are a communication protocol – why not designing them as an „Internet of the future“, a
  – optional,
  – configurable protocol stack
  – on top of TCP/IP
  – such as SMTP or HTTPS
  – for securing distributed peer-to-peer communication
• smart contracts can be handled such as an application layer on top of it
• „legal smart contracts“ may be a standardized sub-layer to implement a „legal constitution“ with mandatory legal aspects to be fulfilled to be compliant with law
• but this requires a lot of standardization – similar to TCP/IP
THANK YOU FOR YOUR ATTENTION.

QUESTIONS???

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