



# Tamper-proof digital assets in Renewable Energy Communities and the Electric Vehicle battery passport

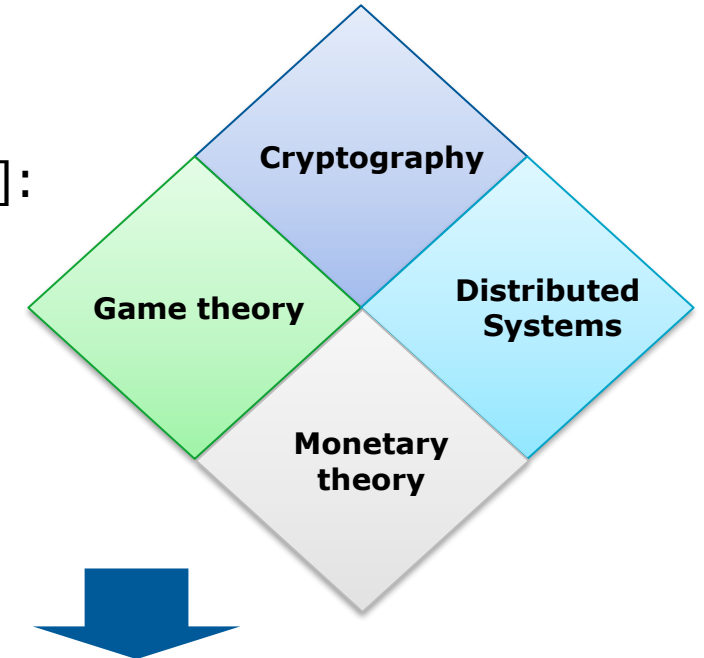
Workshop on Digital ID management and data governance through emerging IoT-edge computing and DLT solutions

Dr. Bernhard Peischl

# Internet of values: from transactions to settlement

- Banking allowed for transactions (commerce) and settlements (money) to be separated [1]
- A transfer of economic value
  - Trustworthy third party
  - Use of common ledger technologies
- Nature's ledger (gold)
  - Has robust parameters for supply and debasement
  - Doesn't move and get verified fast enough
- Mankind's ledger (the dollar)
  - Moves and gets verified fast enough
  - Doesn't have robust parameters for supply and debasement
- DLT: scarce, monetary bearer asset [1]
  - Settle transaction without dependence on trust in a third party
  - Political decisions: locally and temporarily
  - Technological changes affect things globally and permanently

At the crossroad of [2]:

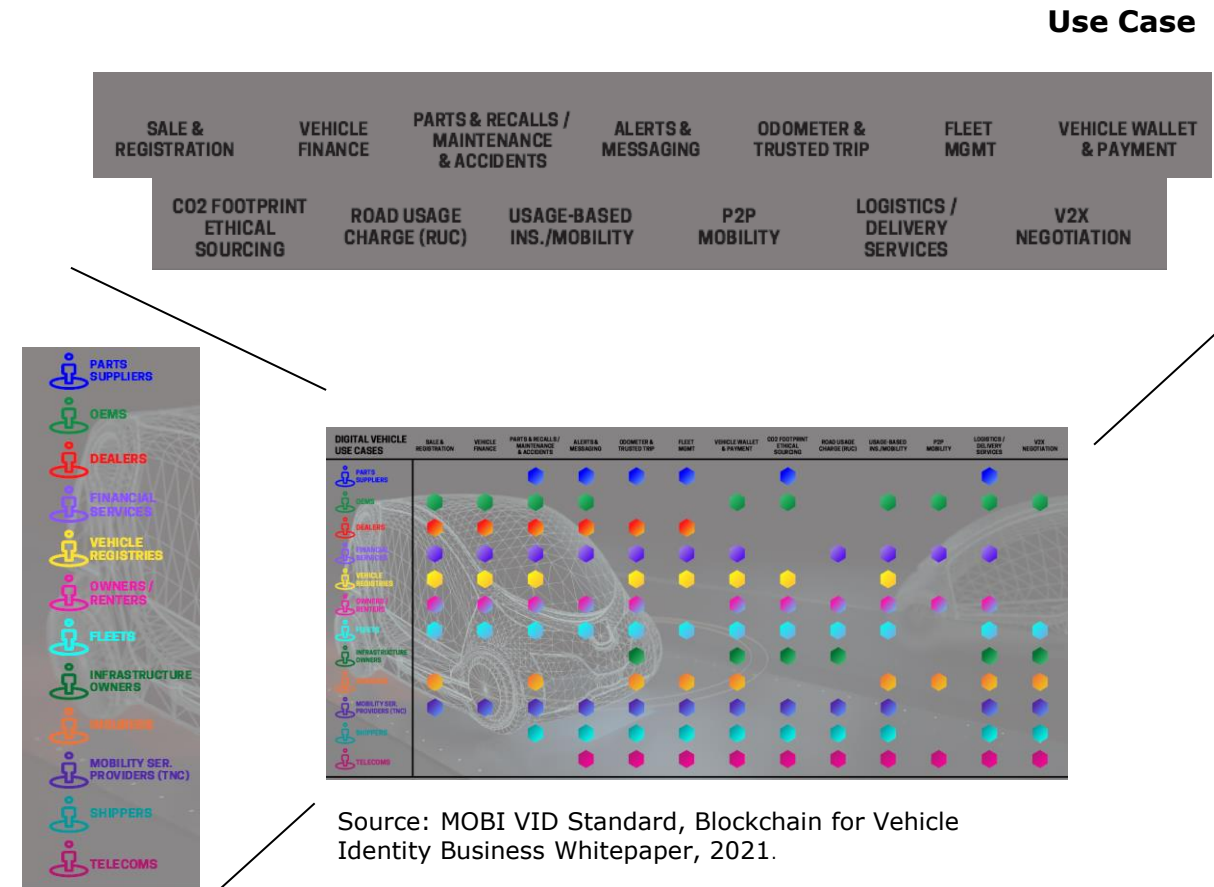


Mainly not a technology –  
A cultural paradigm shift instead



With major legal and  
political implications

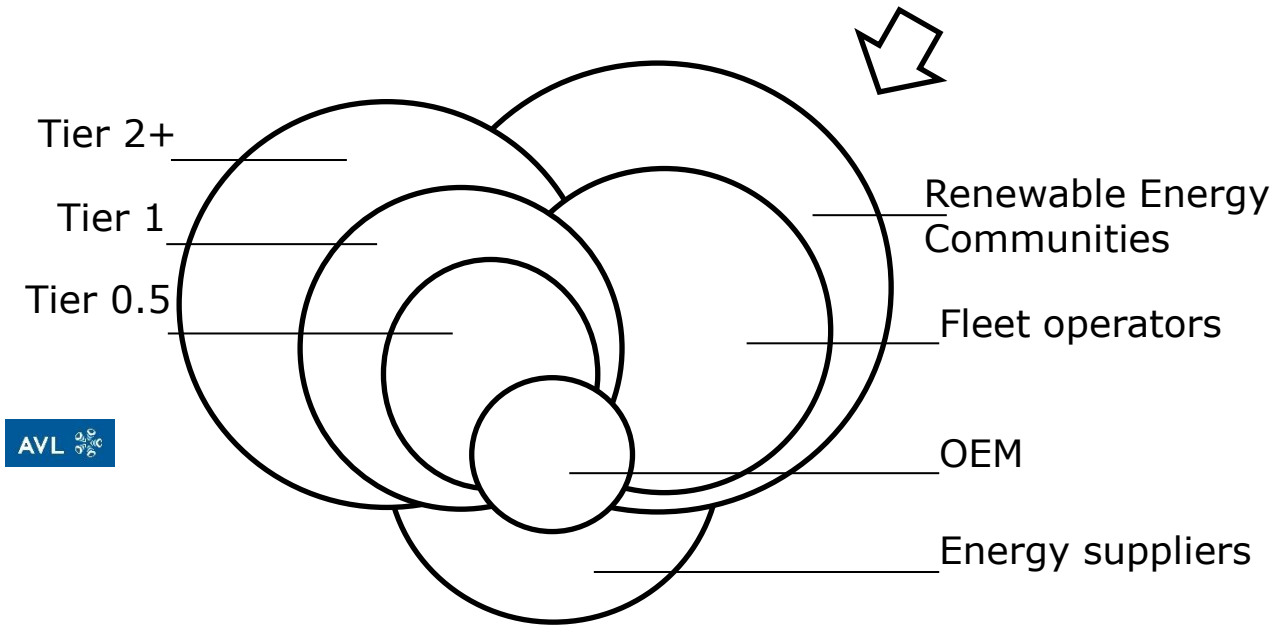
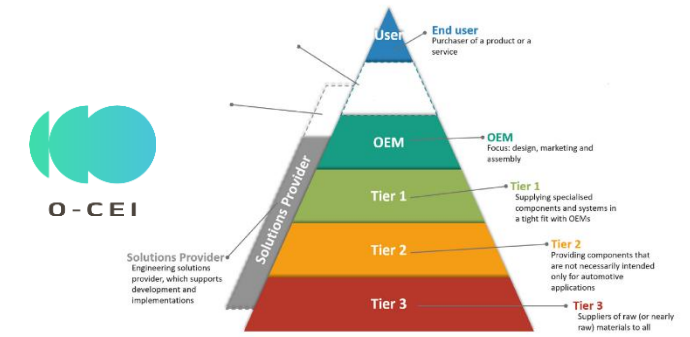
# DLTs and Vehicle Identity

- Asset visibility
  - Reduces information asymmetries and frictional costs across the transportation value chain
- Anchor for use cases
  - Digital vehicle identity creates the trust anchor for connected mobility use cases
- Data provenance
  - Trust anchor secures V2X / V2V transactions and data exchanges at the edge
- Autonomous Economic Agents [3]
  - Vehicle identity + Trusted location + V2X / V2V payments
  - Private sector DLT/blockchain protocols (e.g., Ether, Tether)
  - Programmable digital currency (e.g., digital Euro & Yuan)



# Data sharing as enabler for business cases

- Vehicle owners and fleet operators 
  - State of Health (SoH) data to determine when to replace a battery & EV's value
  - Monetize parking vehicles (spot prices, SoH)
- Energy suppliers 
  - Optimally provide the available energy to mobile consumers (tokenized demand & supply)
  - Reactive power management
- OEM-s, Tier-1-s, and engineering service providers
  - SoH is a key parameter that will influence consumers' vehicle buying choices
  - SoH to be considered in predictive controls

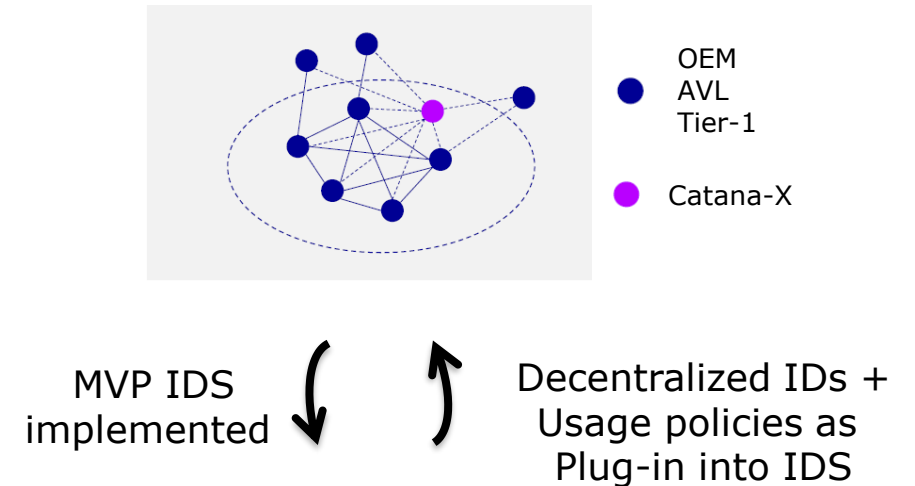


- Industry will require tools to make SoH, energy demand & supply shareable, tamper-proof and tamper-evident
- Such data can be tokenized to make it monetizable (pricing, settlement) to stakeholders in the value chain

# DLTs and International Data Spaces (IDS)

- Limitations of DLTs
  - Large amount of data – off chain information space
  - Transaction throughput limited
- Virtues of DLTs
  - Tokenization (monetization) & compute to data [6,9,10,11]
- Separation of concerns between [4]
  - Efficiency of data crunching (IDS)
  - Immutability of process auditing (DLTs)
- Integration of IDS and DLTs
  - Trust
    - DLTs solve decentralized trust mgmt. e.g., W3C standard on Decentralized Identifiers and Verifiable Credentials [7]
    - DLTs provide the functionality of the certification authority
    - Usage contracts and usage policies
      - Can be implemented as a smart contract [8]

Data Sharing using the Dataspaces Protocol [5]

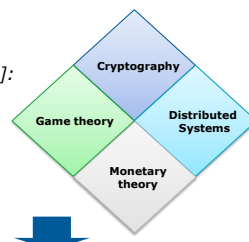


# Summary & Thanks for your attention!

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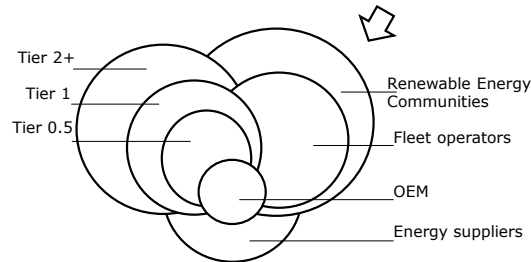


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## Data sharing as enabler for business cases

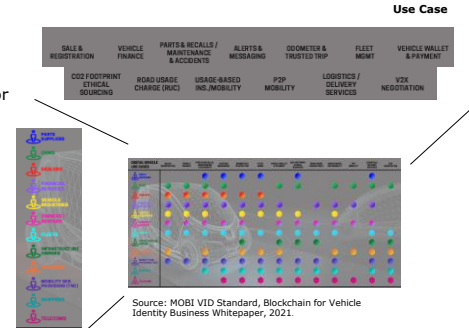
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Source: MOBI VID Standard, Blockchain for Vehicle Identity Business Whitepaper, 2021.

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## DLTs and International Data Spaces (IDS)

- Limitations of DLTs
  - Large amount of data – off chain information space
  - Transaction throughput limited compared to established database technology
- Separation of concerns between [4]
  - Efficiency of data crunching (IDS)
  - Immutability of process auditing (DLTs)
- Integration of IDS and DLTs
  - Trust
    - DLTs solve decentralized trust mgmt. e.g., W3C standard on Decentralized Identifiers and Verifiable Credentials [7]
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    - Implementation can be implemented as a smart contract [8]

Data Sharing using the Dataspaces Protocol [5]



MVP IDS implemented

Decentralized IDs + Usage policies as Plug-in into IDS



Data Sharing using the Ocean Protocol [6,9]

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# References

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- [1] L. Alden, *Broken Money: Why Our Financial System is Failing Us and How We Can Make it Better*, 08/2023, ISBN 979-8988666318.
- [2] F. Ametrano, *Bitcoin and Blockchain Technology*, 10/2023.
- [3] *Blockchain for Vehicle Identity Business Whitepaper*, Mobility Open Blockchain Initiative, 2021.
- [4] *Blockchain Technology in IDS*, Position Paper, 2019.
- [5] B. Otto, *Evolution of Data Spaces*, Gaia-X Webinar, 2021.
- [6] *Ocean – A decentralized data exchange protocol, powered by blockchain technology and a crypto token*; Business Strategy; Ocean Protocol, 2017.
- [7] W3C Standard, [Verifiable Credentials Data Model v2.0](#), 01/2025.
- [8] M. Valenta, B. Sandner, Comparison of Ethereum, Hyperledger Fabric and Corda, Frankfurt School Blockchain Center, 2017.
- [9] Ocean Protocol: Tools for the Web3 Data Economy, 2020.
- [10] Breaking Data Barriers With Acentrik's Whilelable SaaS Solution, Whitepaper, 2024.
- [11] Tokenisierung im Maschinenbau, VDMA, 2024 (in German language).