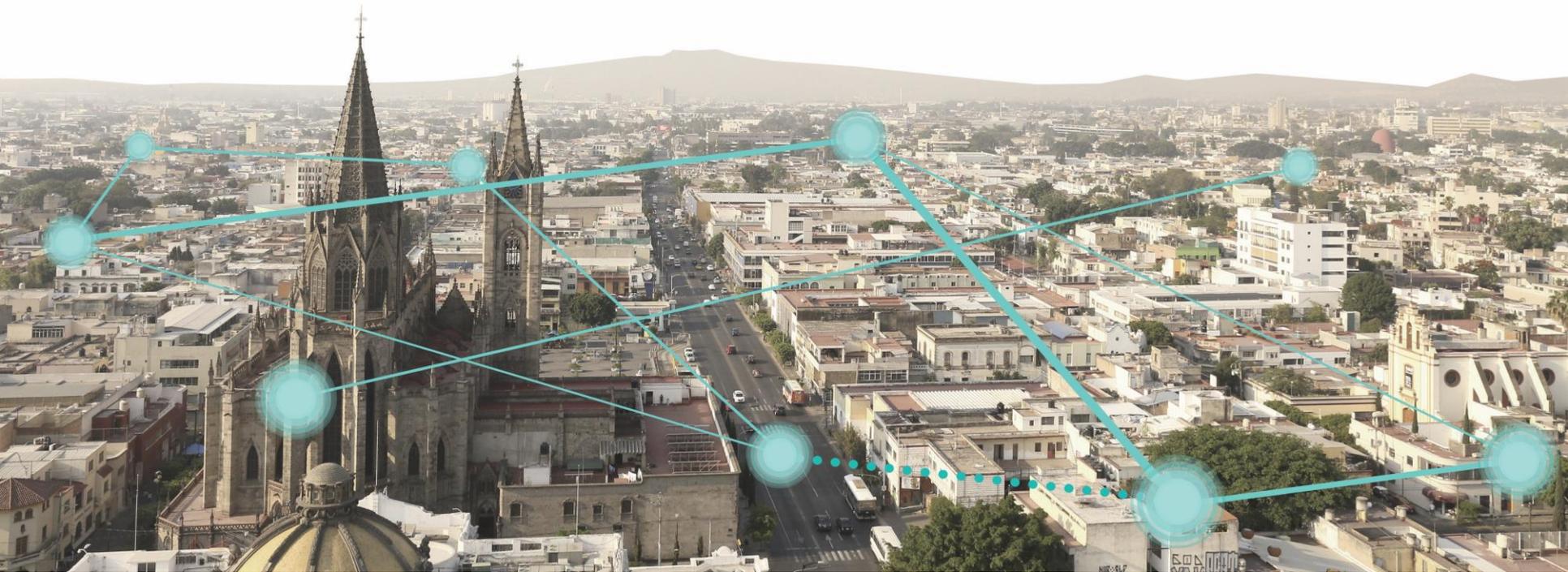




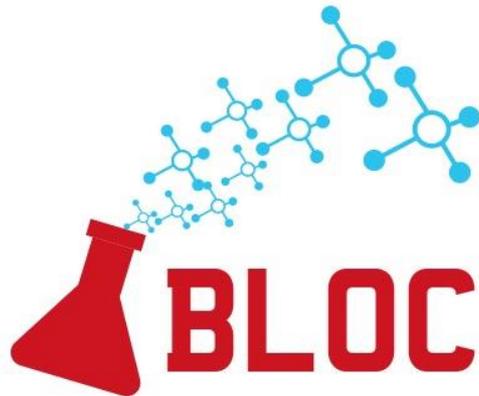
Blockchain as a game changer in the energy sector?

Viktor Peter | Blockchain Governance Expert | GIZ Blockchain Lab





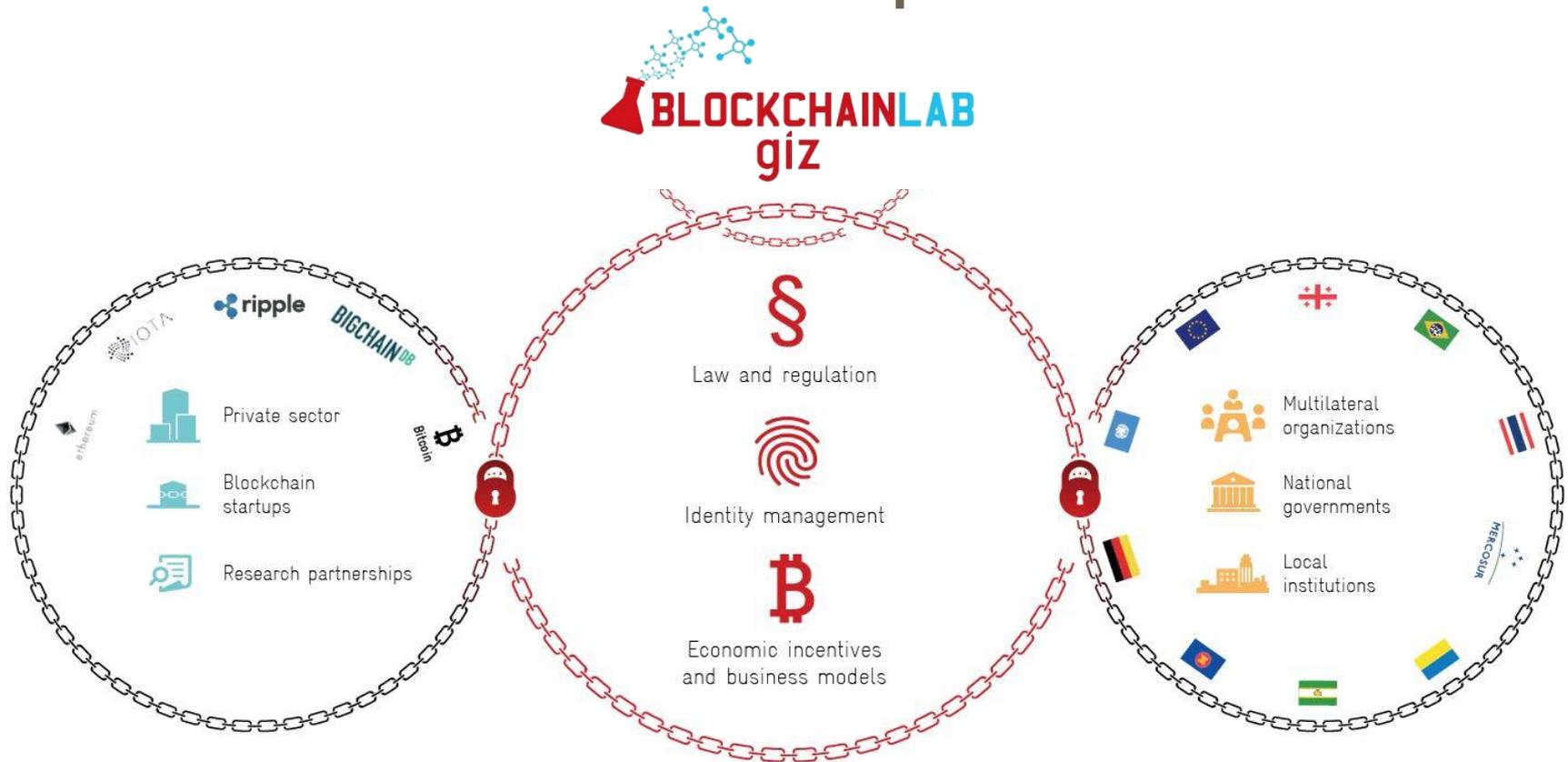
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BLOCKCHAINLAB
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GIZ Blockchain Lab as an „honest broker“ in the blockchain space



The missing link in the chain between bits and atoms



Blockchain use cases for sustainable development

Towards finding facts among dreams and fears and separating the hype from the substance.

What is Blockchain?
Using smart code, blockchains respectively distributed ledger technologies (DLT) provide a decentralized database, or "digital ledger" of transactions that everyone participating in the network can see. The network can be understood as a chain of computers that must all approve an exchange before it can be verified and recorded.

Financial Services
Advantages: Disruption of trusted third parties and inclusion in global economy; Lower transaction costs and reduced settlement time; More efficient cash assistance.
Benefits: Empower the unbanked, especially women; Alternative sources of liquidity for SMEs; Reduction of transaction fees for remittances below 3 per cent.
Challenges: Existing laws and government structures; Currency fluctuations; Low smartphone penetration and literacy rates and lack of internet access.

Energy Markets
Advantages: Increased resilience thanks to decentralized grids; Increased energy efficiency; Incentivization of renewables.
Benefits: Energy access for remote communities; Inclusive peer-to-peer economy and new sources of revenue; Environmental friendly energy production.
Challenges: Resistance of governments to give up control over energy markets; Lack of interoperability and internet access.

Supply Chains
Advantages: Tamper proof verification information; Efficiency gains due to real-time traceability; Inclusion of the producer in the value chain.
Benefits: Increased income of producers; Increased responsibility of multinationals; Transparency in terms of sustainability, e.g. overfeeding, automation.
Challenges: End-point vulnerabilities regarding quality of data; Asymmetric information increases the producers bargaining power.

Aid Delivery
Advantages: Increased transparency of financial flows; Reduction of transaction costs; Increase in transaction transfer; New funding models for charities.
Benefits: Increased trust leading to mobilization of additional financial resources; Increased capacity to serve the most vulnerable.
Challenges: Buy-in by all stakeholders involved might be difficult to achieve as not all are interested in increased accountability.

Space Debris
Advantages: More transparency of space objects through a decentralized space object registry; Compliance with UNOOSA treaty.
Benefits: Incentive for sustainable space management and orbit keeping; Strengthen the participation of developing countries in institutions of global governance.
Challenges: National security concerns; Political reluctance of certain space nations.

Digital Identity
Advantages: Access to rights and public services; Reduction of identity fraud; Self-sovereign identity management; Data minimization.
Benefits: Empower individuals, and especially women, to access public services and in themselves out of poverty; Prevention of human trafficking.
Challenges: Digital literacy and internet access; Acceptance by governments and official institutions required in many cases; Conflicting laws and regulations.

E-Voting
Advantages: Provide an open, distributed set of cryptographic voting and transparent proof; Prevent false recording of votes; Lower costs of voting.
Benefits: Contributes to stronger political institutions; Verifiability enhances citizen participation.
Challenges: Reluctance of governmental entities to decentralize a core mechanism of democracy; End-point vulnerabilities and cultural adoption.

Public Registries
Advantages: Safe storage and verification of ownership; Anti-corruption through decentralization.
Benefits: Increase of trust in institutions through more transparency; Prevent the selling of land that has already been a settlement to the poor; Enforcement of women's land rights.
Challenges: Dependency on the acceptance by multiple stakeholders; Data quality issues.

Free Media
Advantages: Decentralization of the ability to publish content, bypassing censorship; Compelling new funding model that will allow journalists to be paid directly.
Benefits: DLT supported journalism secures public access to information and the protection of fundamental freedoms.
Challenges: Dislike and harmful content can be posted anonymously; Fake news filtering models might not be supported by consumers.

E-Health
Advantages: Health records are stored safely; Patients own their own health data; Share health data across institutions and different locations (interoperability).
Benefits: Increased efficiency of healthcare systems; Data ownership opening new avenues to clinical research.
Challenges: Sensitive nature of health care data; Harmonization of data points is a key challenge for interoperability.

Alternative Governance
Advantages: Create a governance platform where knowledgeable voters get incentivized to share insider information to achieve commonly agreed goals.
Benefits: Increased efficiency of institutional cooperation; Inclusion of formerly excluded yet competent actors in governance decisions.
Challenges: Concerns relevant to national security; Loss of control by centralized institutions over jointly accounts; Limitations of scaled digitalization.

Climate Accountability
Advantages: Standardized CO2 certificate monitoring and transactions; Carbon footprint tracking opens new avenues for a carbon fee regime.
Benefits: More efficient marketplace for carbon asset trading to reduce carbon emissions; Incentives to use more environmental friendly production/transportation methods.
Challenges: Difficulty in clearly defining the assets each market participant holds as well as establishing the exact amount of environmental harm done by a product.

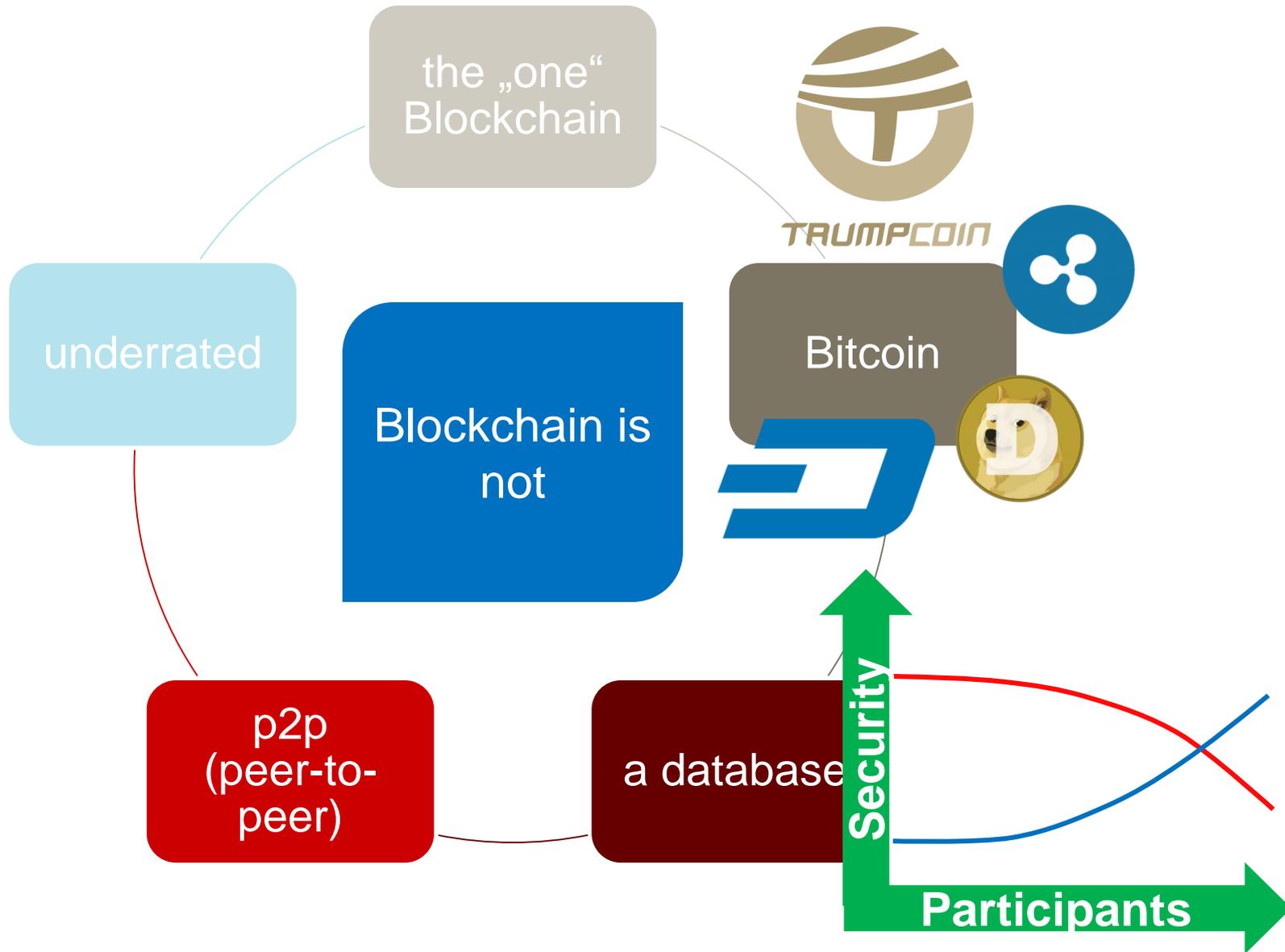
Circular Economy
Advantages: Financial reward in the form of a cryptographic token in exchange for depositing responsibility.
Benefits: Incentivizing sustainable waste management (in offers); Support the reduction of marine pollution through tokenizing the removal of debris and waste.
Challenges: Responsibility to oversee recycling of their products is not in the economic interests of consumers.

Water Governance
Advantages: Tamper proof record of water usage and distribution; Equate access to information in different (multi-stakeholder) settings.
Benefits: Reduce water scarcity by providing mechanism to overcome externalities; Real-time monitoring and crisis prevention.
Challenges: Adequately track the use of water by each participant; Some existing users need an agreement of adjacent users.

An introduction to blockchain



Misconceptions about Blockchain



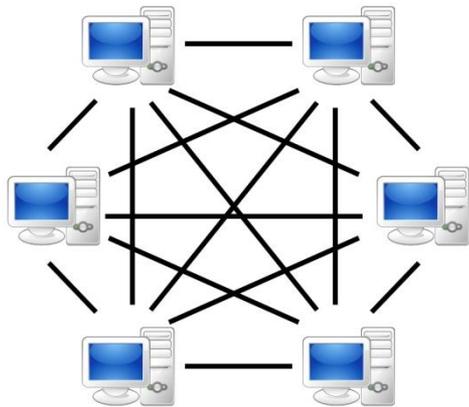
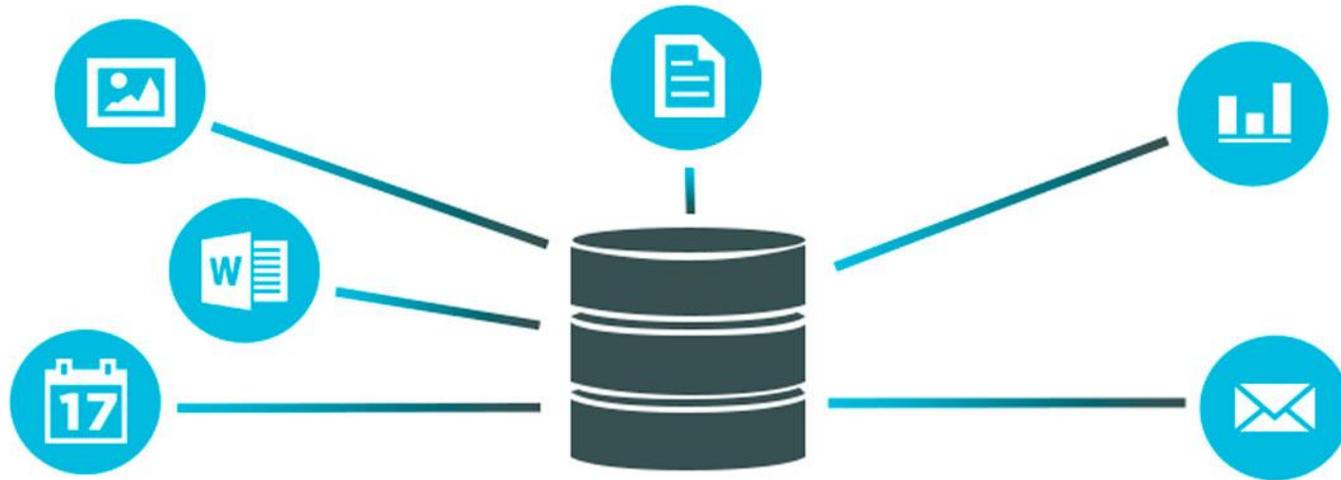
Data (-transactions) without DLT



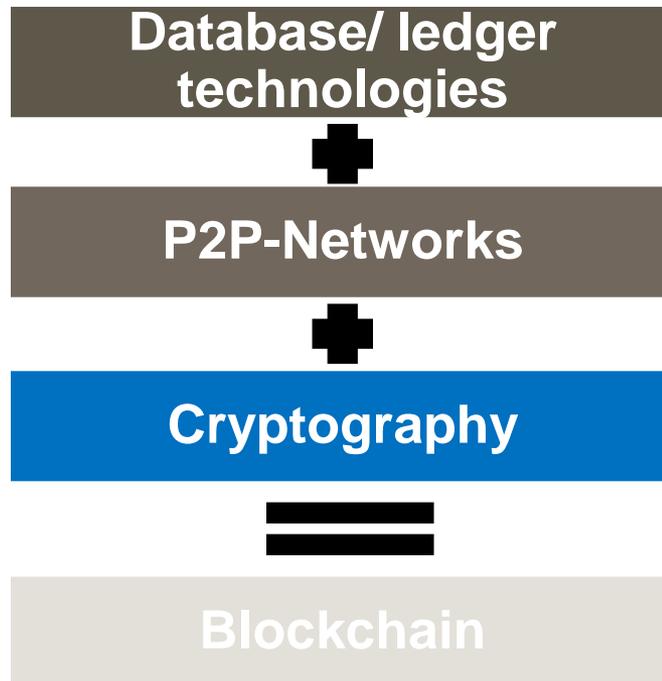
Data (-transactions) with DLT



What are the technologies behind Blockchain?



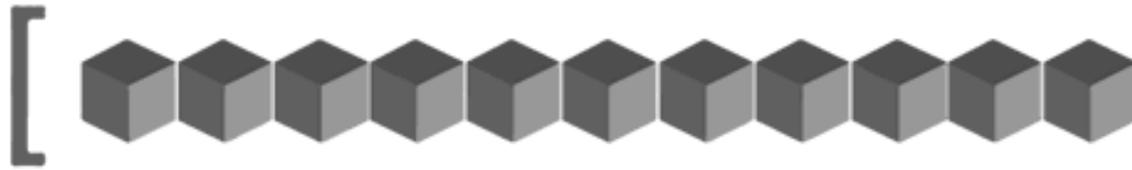
P2P-network



What is a blockchain?



New Block

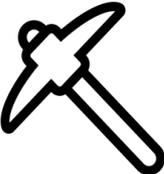


Blockchain →



Actors within DLT - simplified



	User	Node	Miner
			
Engage transactions	 (indirect via Nodes)	 (direct)	 (generally possible)
Possesion of the whole data log			
Check transactions (cover, signatures, etc.)			
Put transactions in Blocks, calculate hashes, generate Blocks			



Public, private and federated DLT - simplified

Private DLT

Federated DLT

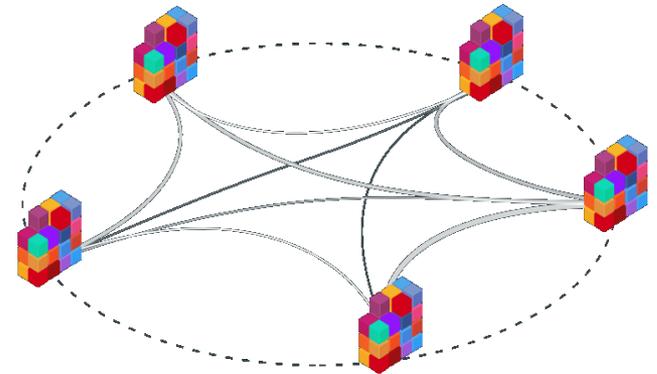
Public DLT

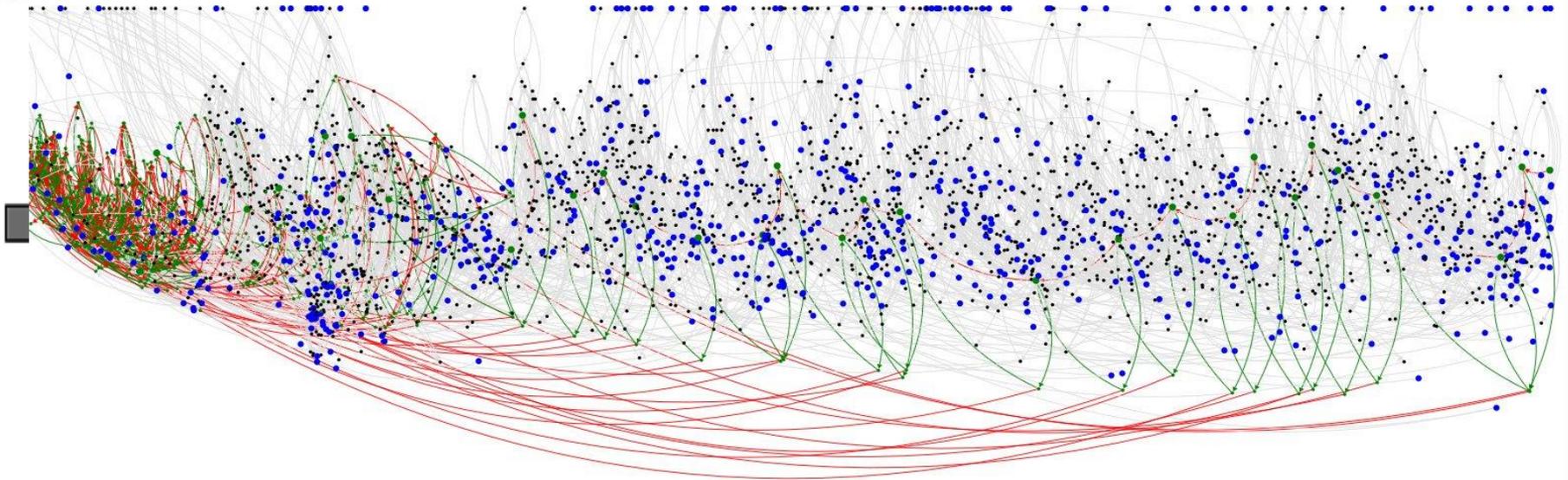
Velocity
Governance
Known Identities

Security
Resilience
Pseudonymity



- **Blockchain 2.0: "Bringing intelligence, applications and automation into the blockchain".**
- Not only the presentation of financial information, but also meter readings, certificates, ...
- Smart Contracts: if-then-relationships, which are recorded in the blockchain
 - If the temperature in room xyz exceeds 25 °C, then air conditioning abc is turned on.





■ IOTA: Blockchain without blocks

- "Operating System of the Internet of Things."
- Improve scalability
- No transaction costs
- Increase transaction speed



Consensus mechanisms in blockchains

A	B
C	D



#transactions-
block100

A	B
C	D



#transactions-
block100

A	B
C	D



#transactions-
block100

Proof-of-Work:

“I worked to validate the transaction. I was faster and therefore better than my competitors. The solution is right and I get money for it. Why should I create a wrong or manipulated block? Then I wouldn't earn anything from my work.”

Proof-of-Stake:

“I have invested a lot in this blockchain, its continued existence and functionality are important to me. I will build you a new block and vouch with my assets invested in this blockchain for the correctness. If the block is wrong or manipulated, I lose my stake.”

Proof-of-Authority:

“In the conception of this blockchain, I was set as the authority. You know me and trust me. So why should I create manipulated blocks?”



Blockchains

An innovative IT-solution to transform the way we handle data

A blockchain is a constantly growing **list of transactions** which are **stored in blocks** and are secured through **cryptography**. A **decentralized network of computers** is processing, verifying and validating all entries.

Promises of DLT-solutions

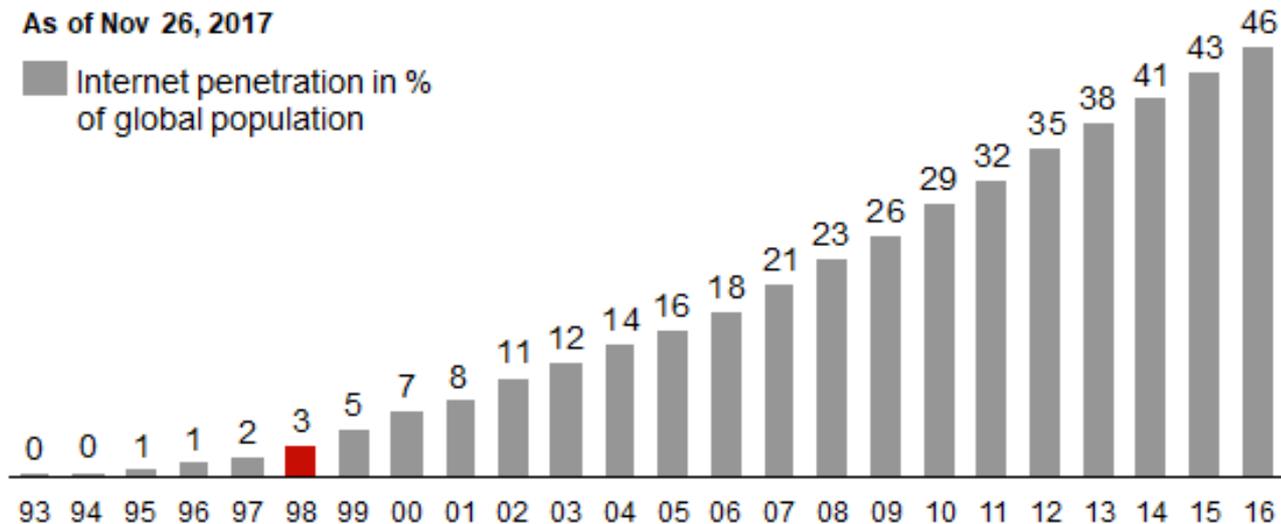
- **Transparency:** Traceability of transactions
- **Disintermediation:** „Creating trust through technology, not through authority“
 - Crypto-economics: incentive structures and game theory as a vehicle for new forms of collaboration
- **Resilient and secure IT-infrastructure**
- **Inclusion:** lowering potential entry barriers
- **Automation** of contracts or processes (process efficiency)



Cryptocurrency adoption: Just getting started

As of Nov 26, 2017

■ Internet penetration in %
of global population



↑
We are here
in crypto

Sources:

- internetlivestats.com
- Coinbase data (@alastairmilne on Twitter)
- Wikipedia Household information

Number of Coinbase Accounts	13.3m
Coinbase as % of bitcoin trade	5%
Implied # of total crypto exchange accounts	266m
Assumed # of accounts / household	4
Total number of unique crypto Households	66.5m
As % of total world wide households	3.5%



Thank you!

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