

Blockchain-Based Systems Engineering

Prof. Dr. Florian Matthes

Sebis-Day, 20.9.2018

Chair of Software Engineering for Business Information Systems (sebis)
Faculty of Informatics
Technische Universität München
www.matthes.in.tum.de

Entwicklungsprojekte

- Landesnotarkammer Bayern: Digitaler Nachlass
- IHK München: Digitale Zeugnisse
- Chip Card Solutions, DRK: Absicherung von Blutkonserven mit RFID und Blockchain-Technologie
- Noumena Digital AG: Language Engineering for Smart Contracts
- Tr8cy: Peer2Peer Trade Financing Platform

Ausbildung und Beratung

- Vorlesung Blockchain-based Systems Engineering (2V + 2Ü)
- GS1 Köln: Blockchain Governance (Tauschplattform für Paletten)
- Blockchain Hackathons (IBM, TU München, Ethereum, ...)
- Bayerische Ministerien (Justiz, Finanzen, Soziales)
- IHK, Münchner Kreis
- Unternehmen (Siemens, Münchner Rückversicherung, goetzpartners, ...)
- Öffentlichkeit (Konferenzen, Workshops, Deutsches Museum, ...)
- VC Investoren
- Juristen

- Start**
- News +
- Events +
- Call for Papers
- Mission
- Research +
- Education +
- Publications
- People +
- Get Involved

Start

Welcome to the TUM Blockchain Research Cluster

The Blockchain Research Cluster (blockchain.tum.de) is an interdisciplinary network of chairs and research groups at the Technical University of Munich, which investigate and further develop the technical, economic, legal and social aspects of blockchain-based solutions.

The cluster organizes a monthly meeting for interested members of the Technical University of Munich as well as external guests to report on various topics (technologies, research results, applications). In addition, introductory events and lectures by guests take place.

To be informed about future events and results, please subscribe to our newsletter or use the Slack channel.

- [Follow us on Twitter](#)
- [Sign up for our Newsletter](#)
- [Join our Slack-Channel](#)

NEWS →

Blockchain Lecture starts with over 450 Students 07.05.2018

Since the beginning of the semester, the lecture "Blockchain-based Systems Engineering" takes place every Friday from 3 to 5 pm. Over 450 Students visit the lecture regularly, learning about cryptography, networks, the anatomy of Blockchain and different implementations such as... [\[mehr\]](#)

UPCOMING EVENTS →

Prof. Dr. Tyler Moore talks about "Price manipulation in the Bitcoin ecosystem" on 20th of June @ TUM 20.06.2018



The chair of Cyber Trust has invited Prof. Dr. Tyler Moore, Tandy Assistant Professor of Cyber Security & Information Assurance at the University of Tulsa, USA to give a talk about "Price

TUM Blockchain Research Cluster

Contact

Lehrstuhl I19
Boltzmannstraße 3
Garching by München
85748 Germany

E-Mail: blockchain@tum.de

Stay in Contact

[Follow us on Twitter](#)

[Sign up for our Newsletter](#)

[Join our Slack-Channel](#)

Upcoming Events

20.06.2018
Prof. Dr. Tyler Moore talks about "Price manipulation in the Bitcoin ecosystem" on 20th of June @ TUM →

15.06.2018
Prof. Nicolas Christin talks about "Demystifying the Dark Web: Measuring and analyzing online anonymous marketplaces" on 15th of June @ TUM →

Blockchain technology is ...

...the new Internet and the foundation for a new economy.



It enables **intermediary-free** transactions of **digital, non-copyable goods** without the need to trust the other party.



Digital identities of people or **machines** can enter into secure transactions and all transaction details are stored **immutable** and **decentralized**.



Automated, programmable contracts can ensure contract compliance.

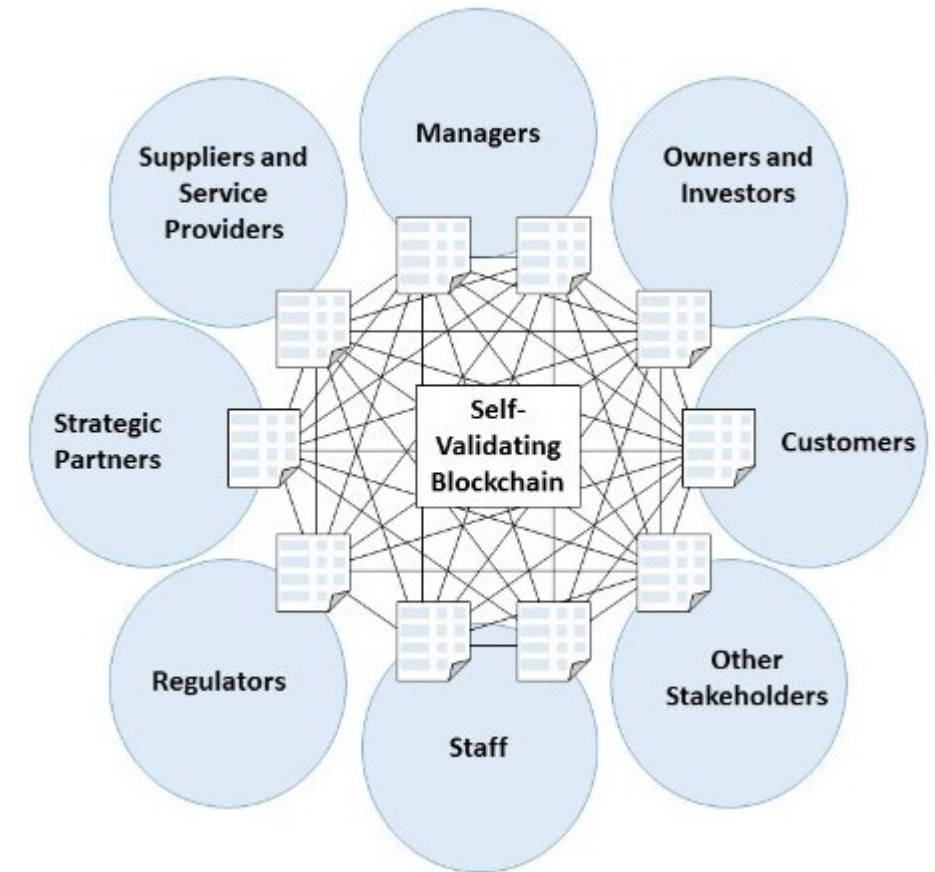
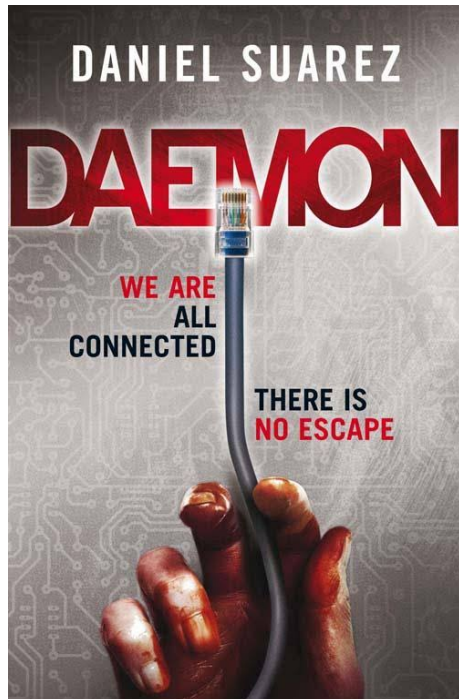
"We believe that the Blockchain will have the greatest influence on contracts, logistics and supply chain, healthcare, public administration, asset clearing, property and transactions."

- Greg LaBlanc

Decentralized Autonomous Organizations (DAOs)

Idea

- Create a fully digital (virtual) organization.
- The organization exclusively uses Smart Contracts to interact with its shareholders, employees, customers, suppliers, partners and public authorities.
- These stakeholders can be humans or organizations in the “real world” or other DAOs.



Idea

- Focus on cross-enterprise Internet of Things use cases that do not require strict transactional semantics.

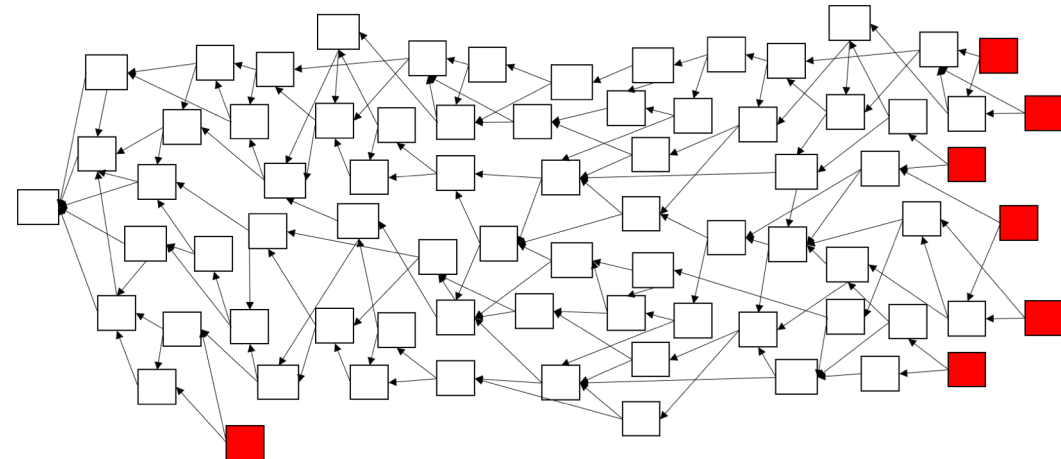
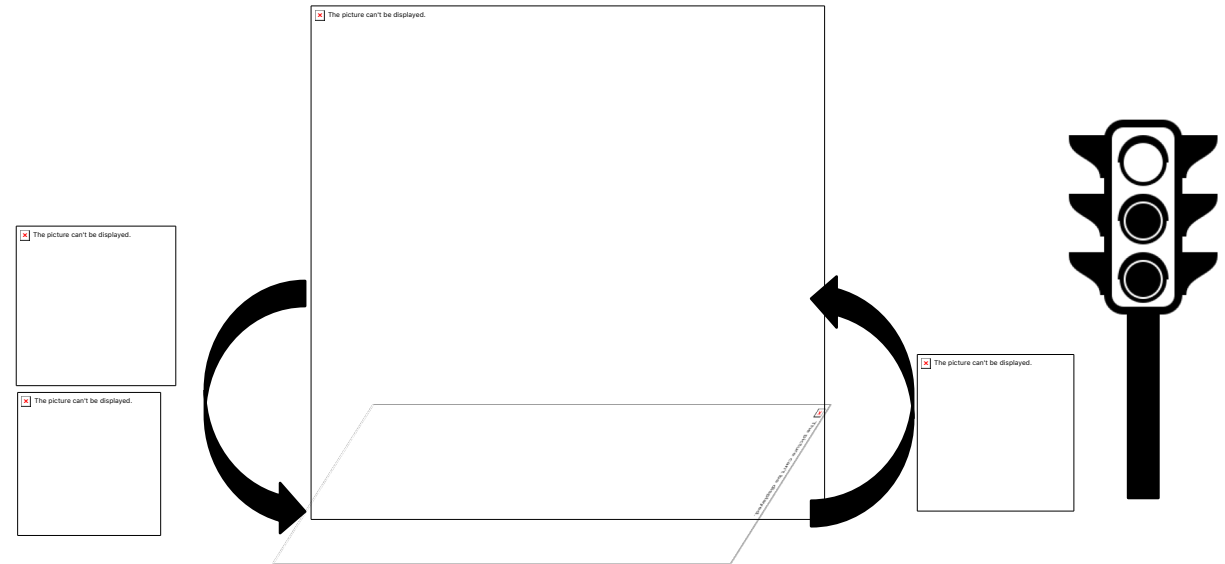
Example: Inductive charging of e-car

- Instant authentication
- Trustless micro-payments
- Fast
- Scalable
- Immutable

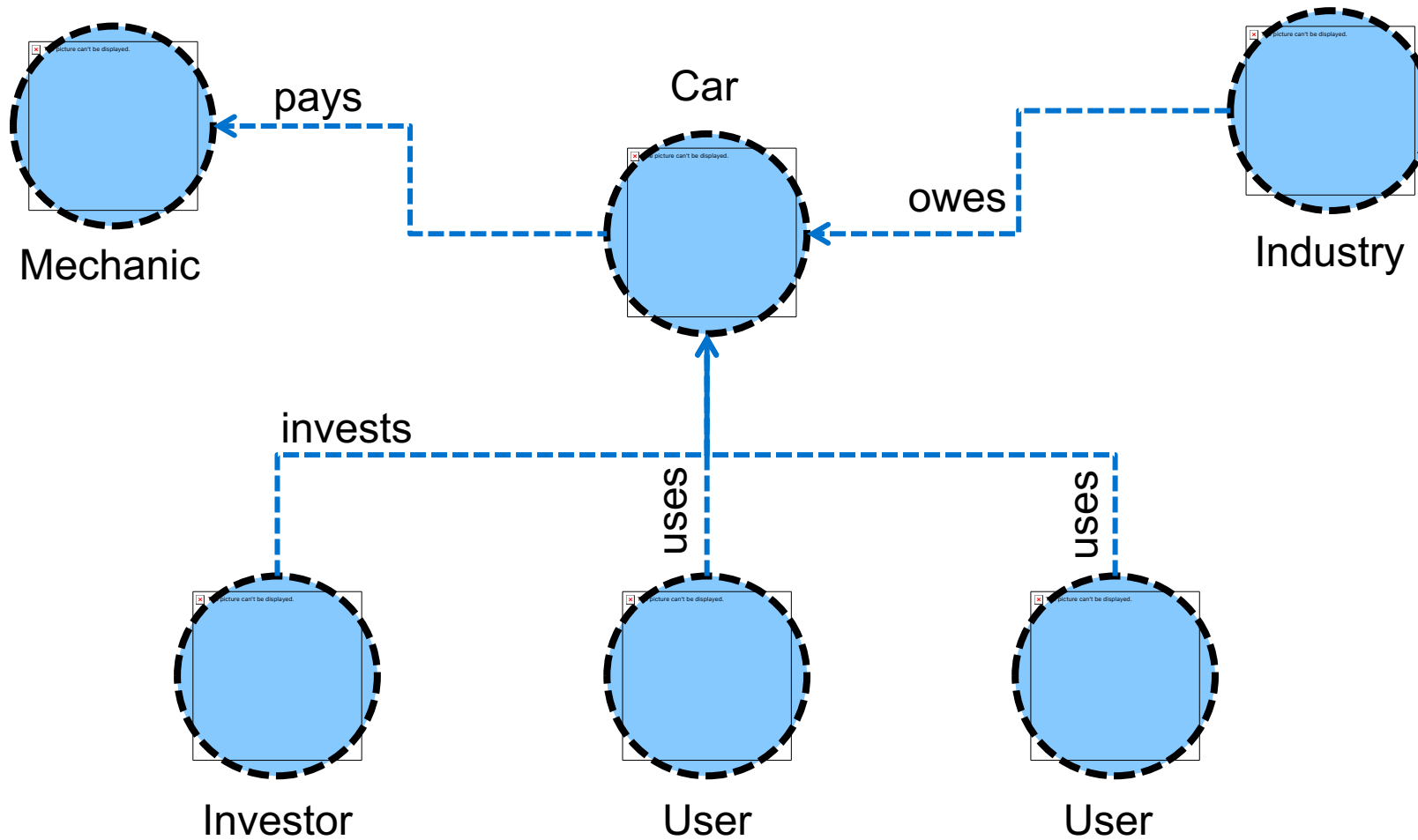
Core Concepts

- Replace the linear chain by a directed acyclic graph. Do not use blocks, but transactions only.
- Atomic exchange of information and payments
- Each transaction has to validate two other transactions.

Not yet ready for production



Self-owning technical systems



Blockchains and Bitcoin have a reputation problem



- Incredible waste of energy and resources
- Use for shady business models
 - Speculative trading
 - Gambling
 - Trafficking (humans, drugs, ...)
 - Cyber crime
 - Ransomware attacks
 - ...
- Casino economy
 - ICO scams
 - Exchange frauds
 - “Lost” or “locked” crypto money
 - ...
- Huge gap between expectations and maturity of the technology

Comparison of current Blockchain-based technologies with established centralized solutions

Advantages

- Decentralized management (trust in one party → trust in a system of multiple parties)
- Transparency of all transactions
- Traceability of the complete transaction history
- Pseudonymity of the wallet owners
- *Built-in* financial incentives for early adopters and network growth (→ business model)

Opportunities

- Innovation thrust for IT solutions in the global markets (finance, energy, mobility, health-care, trade, ...)
- Lowered entry barriers for IT-savvy players with limited financial resources
- Impetus to re-evaluate established business models and economic mechanisms (e.g. platform economy)

Disadvantages

- Technical complexity
- Efficiency & scalability (energy, space, time)
- Semantic complexity (game theory, probabilistic reasoning, concurrency, ...)
- Difficult to understand and use (by end-users, developers)
- Challenging security requirements (public, transparent, high-stake, ...)

Risks

- Regulatory (ethical, legal) risks
- Over-promising, inflated expectations