BLOCKCHAINS

ARCHITECTURE, DESIGN AND USE CASES

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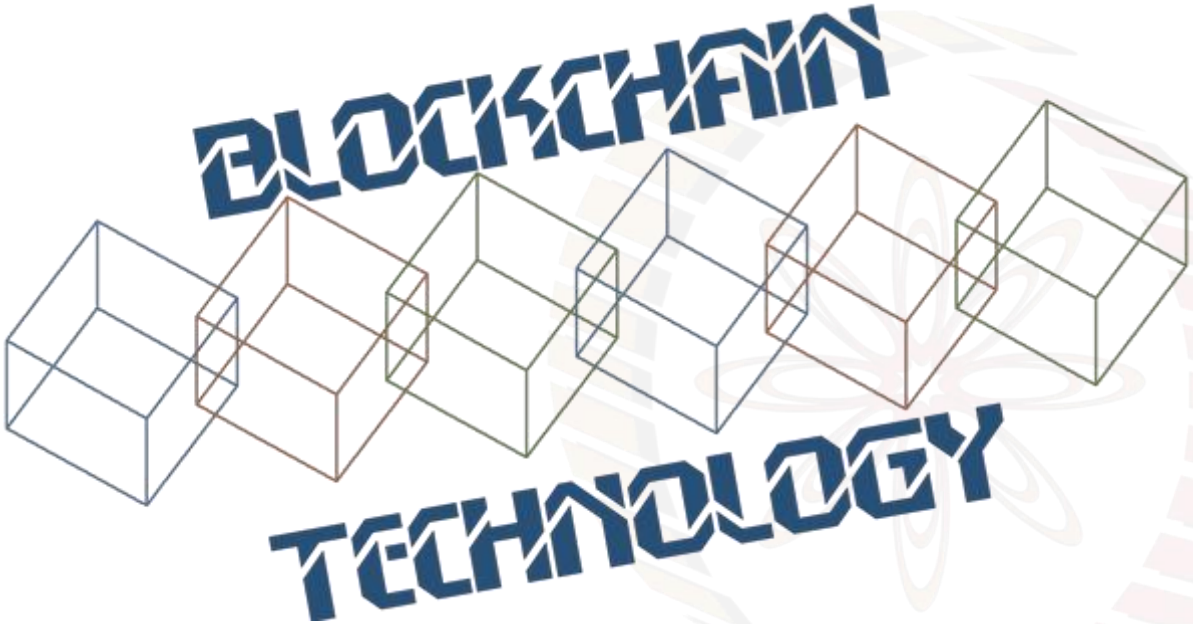


Image courtesy: http://beetfusion.com/

BLOCKCHAIN IN OTHER INDUSTRIES

Blockchain for Healthcare: Use Cases

Patient Consent and Health Data Exchange

- Secure medical data exchange including EMR, genomics, image, exogenous / IoT, clinical trials data,..
- Blockchain ensures consent, compliance, auditability, provenance, governance
- Outcome based contracts

Payment and Claims

- Smart Contract between Provider / Payer / Patient
- Rethinking medical claims processing
- Replacing healthcare clearing house
- Enables value added functions of dispute resolution and fraud management

Pharma Supply Chain Provenance and traceability

- Motivated by patient safety, counterfeit fraud, drug traceability, brand protection
- End-to-end drug traceability and provenance, regulations including DQSA

Rethinking Clinical Trial Management

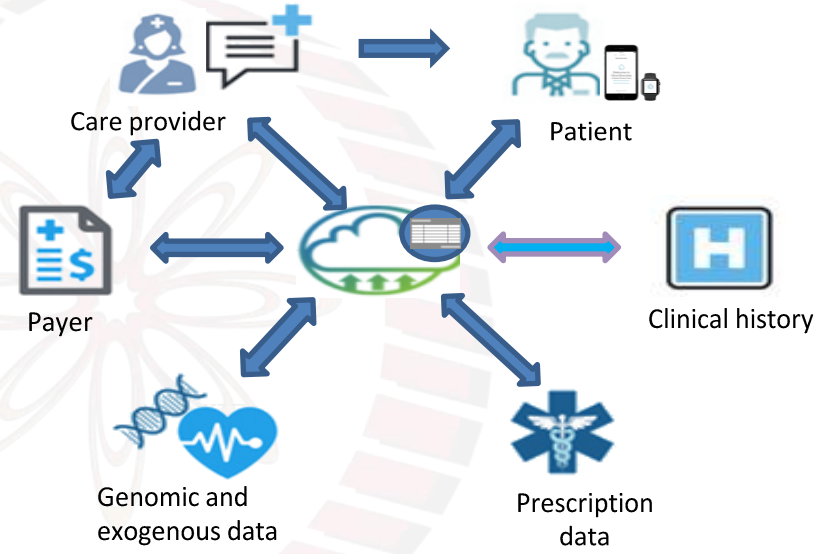
- Auditability and use for fraud detection
- Provenance of patient data through the chain of exchange
- Traceability of protocol design elements to data collection

Patient Mediated Health Data Exchange

1. Manage CONSENT
Trusted, efficient management of patient consent

2. EXCHANGE data
Compliant exchange of patient medical records

3. INDEX information
360 view of patients medical records



- Patients **register consent** in the blockchain to allow care providers access to information required in their care
- **Compliant data exchange** is driven from available consent
- Patients can access a **personal index** of their health information compiled as information is exchanged.

Notable Startup: GuardTime

- Partnered with Estonian e-Health authority in 2016 to secure patient records
- Working with Estonia, Thailand among other countries to secure government and public records
- Active in multiple industries including supply chain and insurance

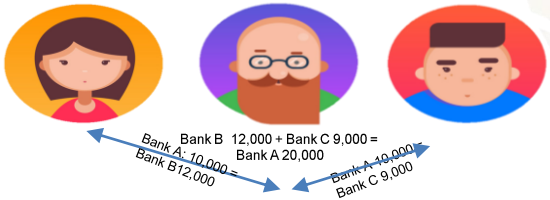
- Founders were the first to formally prove security properties of hash chains back in 2004! (check out their paper in the Fun Reading section)
- https://guardtime.com/technology

Loyalty Points Exchange

China Union Pay

Channels to exchange points

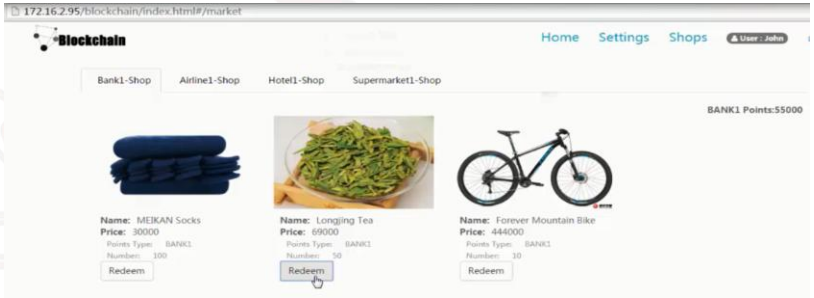
Transfer within Banks



Cross Bank Exchange

Notable startup: https://loyyal.com/

Channels to redeem (online + offline)



online shops

Scan gift and generate QR Token
Smart POS

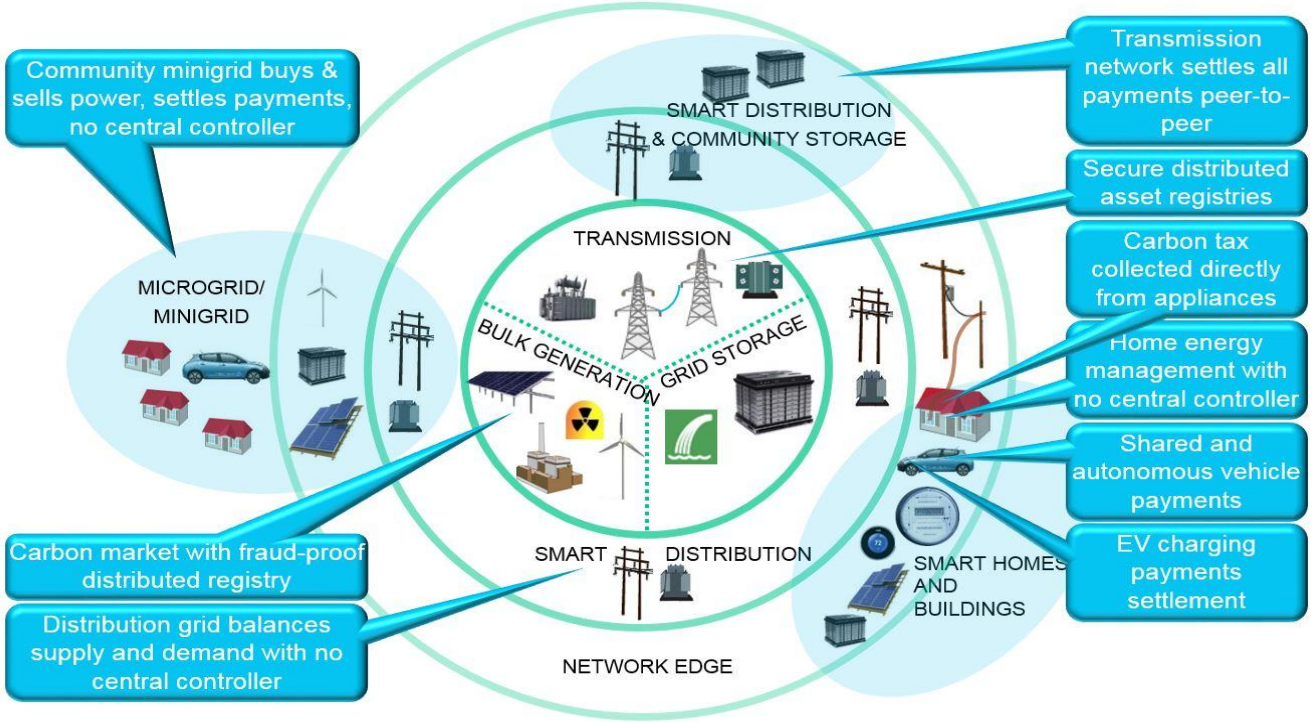
Check available points

Scan QR Token on phone to request transaction

Complete

stores

Blockchain in Energy Markets: GridChain



Source: Bloomberg New Energy Finance

Renewable Energy Flexibility

What?

- Tennet must match supply & demand of electricity. This new era of renewable energy meant that existing systems are under strain to keep up.
- New battery technology enables a new near-instantaneous source of power to adapt to requirements

How?

- The blockchain presents the operator from Tennet with a view of the available pool of flexibility, ready to activate at the push of the button
- This then signals batteries in Electric Vehicles connected to the grid (Vandebron) or distributed power banks in consumers homes (Sonnen)

Benefits

- Giving the flexibility to match supply & demand
- Rapidly understanding the resources available

Media

- Ujo Music is an Ethereum based, ConsenSys backed music software services company for the modern economic landscape of music.
- Licensing + Payments – Ethereum
  - Ethereum is utilized to build out flexible & modular licensing systems
  - Enables automated payments to rights holders based on licenses they design themselves in a friendly and easy-to-use interface
  - Can be extended to incorporate a wide range of additional functionality: programmatic contracts, variable pricing, payment routing.
- https://ujomusic.com/

Fun Reading

- How Blockchain can Streamline Healthcare (3 mins): https://www.youtube.com/watch?v=h3aZ8mrlR-0
- Healthcare Challenges and Blockchain (33 mins): https://www.youtube.com/watch?v=LyO0DPyosLY
- “On provably secure time-stamping schemes” (GuardTime), Ahto Buldas, Märt Saarepera, In Advances in Cryptology – AsiaCrypt 2004: http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.65.8638
- Powerledger, Decentralized Energy Trading (8 mins): https://www.youtube.com/watch?v=9-aGI40tYf0

thank you!