

Introduction to Blockchain

18th ISSA Symposium

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24 May 2016

Disruptive technology themes and business trends

Artificial Intelligence
step-changes functions
and processes

Cloud and shared economy
technology lowers cost to offer
products and services

Customer Experience
disrupted and bank's front-end
disintermediated

Automation of client
sales and services

Machine Learning



Marketplaces / API



Mobile

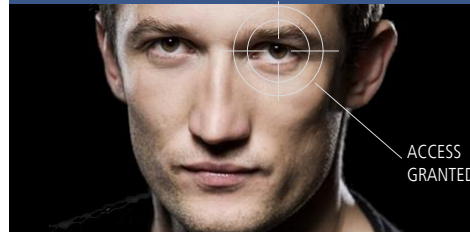


Crowd-sourcing
of capital

Natural Language Processing



Security



Internet of Things

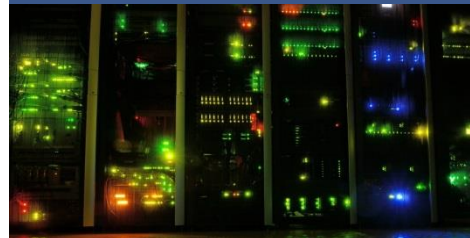


Digital utilities for
financial services

Data analytics



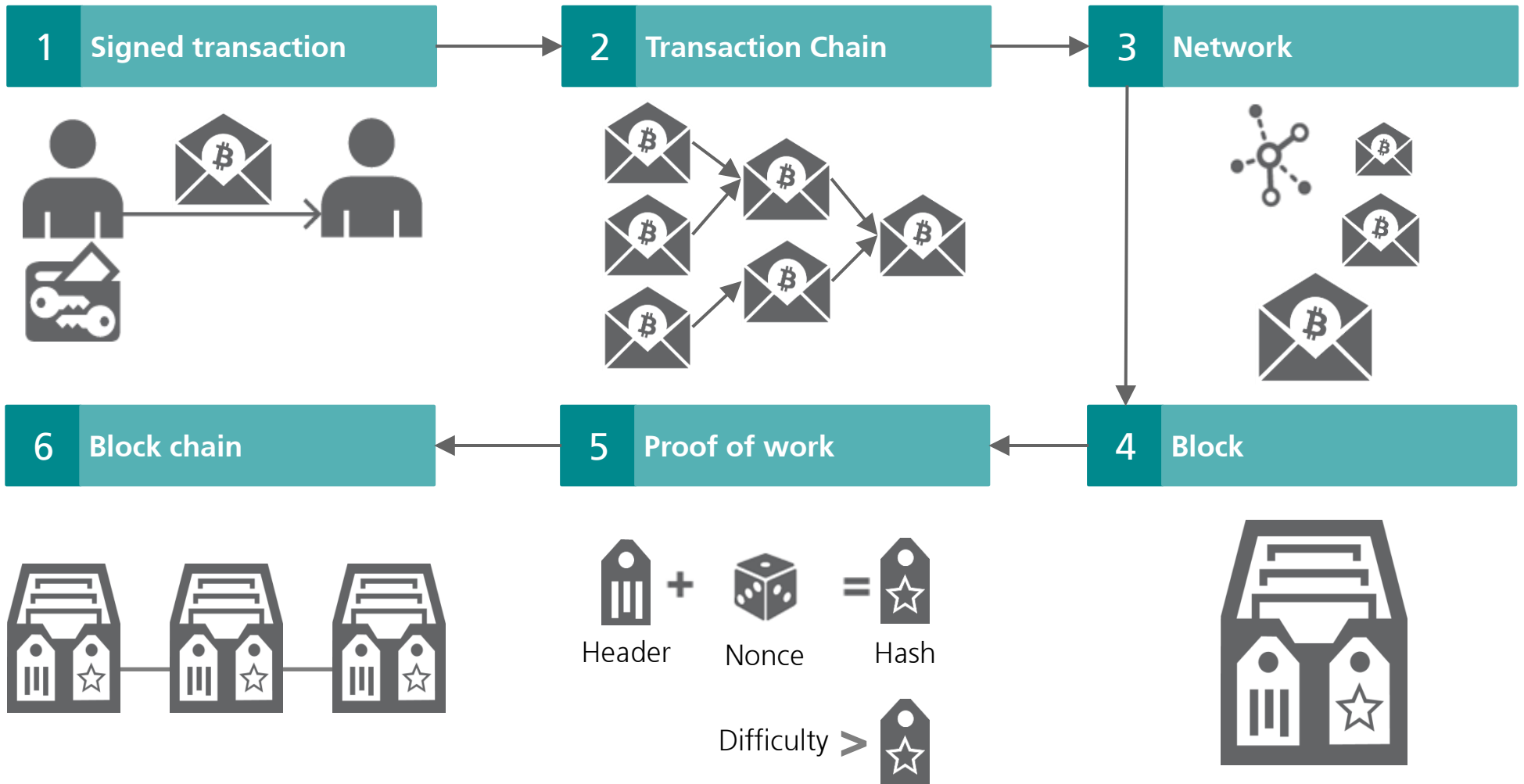
Cloud



Crypto-currencies / Blockchain



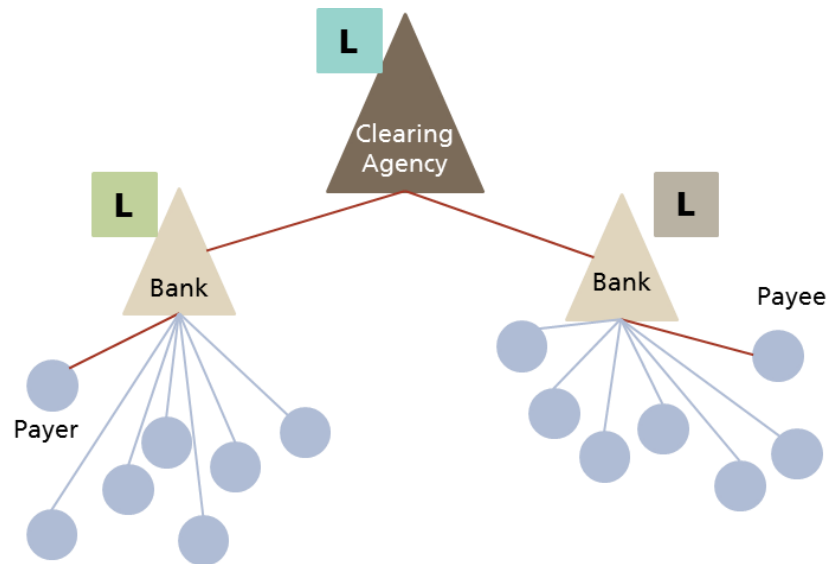
Bitcoin blockchain explained



Source: <http://businessinsider.com>

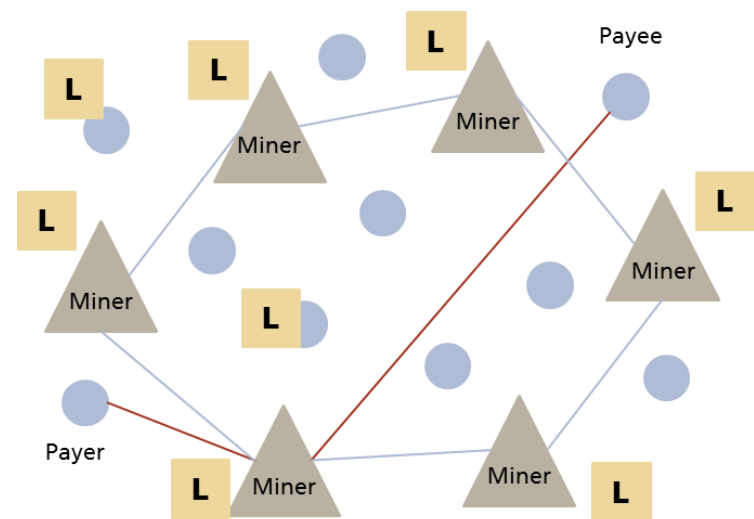
Centralized vs Distributed ledger technology

Centralized Ledger



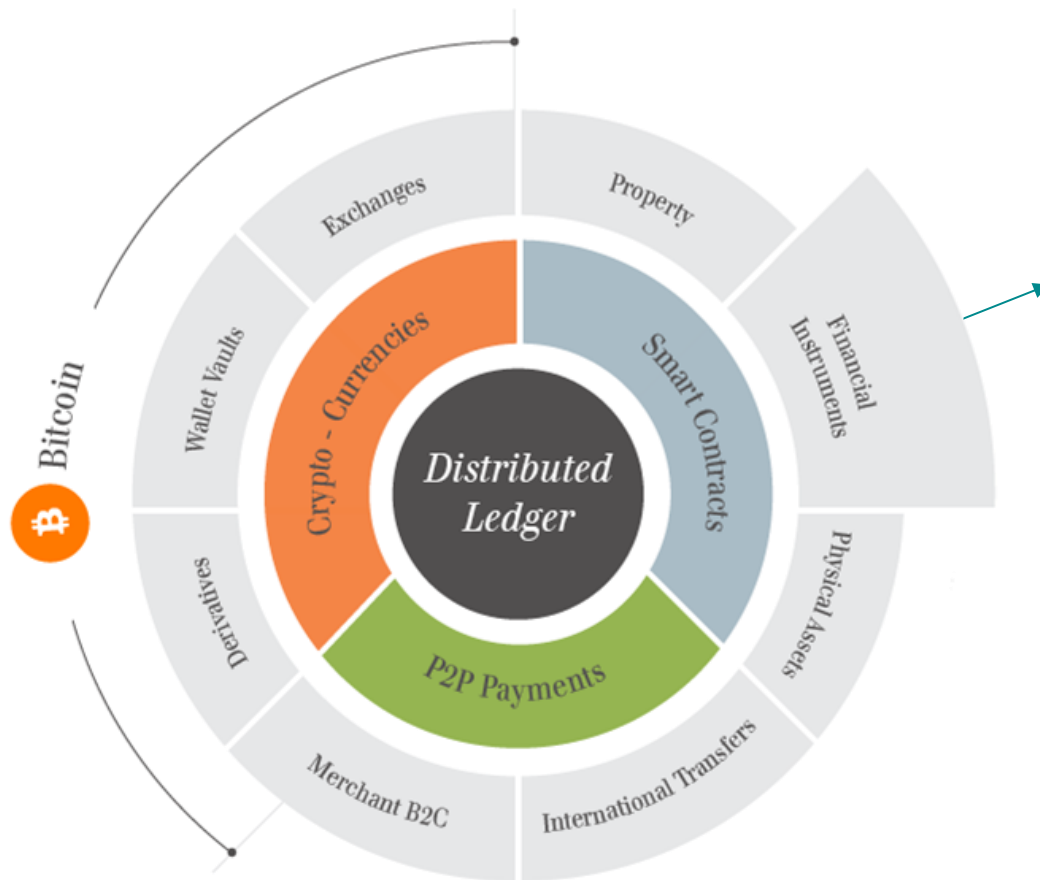
- ▶ Trusted agents (banks and clearing agents) in the network maintain and update ledgers which track ownership of assets
- ▶ The ledgers are not directly integrated or standardized in a technical sense
- ▶ Ledgers are strictly confidential
- ▶ Trusted agents prevent double spending
- ▶ Trusted agents move the funds through numerous hops, each hop introducing a nominal fee per transaction, counterparty risk and settlement delays

Distributed Ledger



- ▶ A network of interconnected computers collectively manages a single ledger which tracks ownership of digital assets
- ▶ The ledger is public, but everyone uses pseudonyms
- ▶ Participants are incentivized to maintain and update the ledger and everyone can become a maintainer
- ▶ The network uses a single protocol to maintain the ledger
- ▶ Losing a maintainer has a minimal impact on the network
- ▶ Double-spending problem solved without central agents
- ▶ Introduces a new fee scheme with a potential to reduce many of the fees and underlying counterparty risk

From Crypto-Currencies to Smart contracts



Smart Contracts

Outline of features

- ▶ For use with any asset/asset class
- ▶ Programmable contracts, multiple counterparties
- ▶ Self-execute, self-enforce, self-verify, and self-constrain
- ▶ Triggered events from agreed information providers
- ▶ Network of nodes providing distributed infrastructure

Core benefits

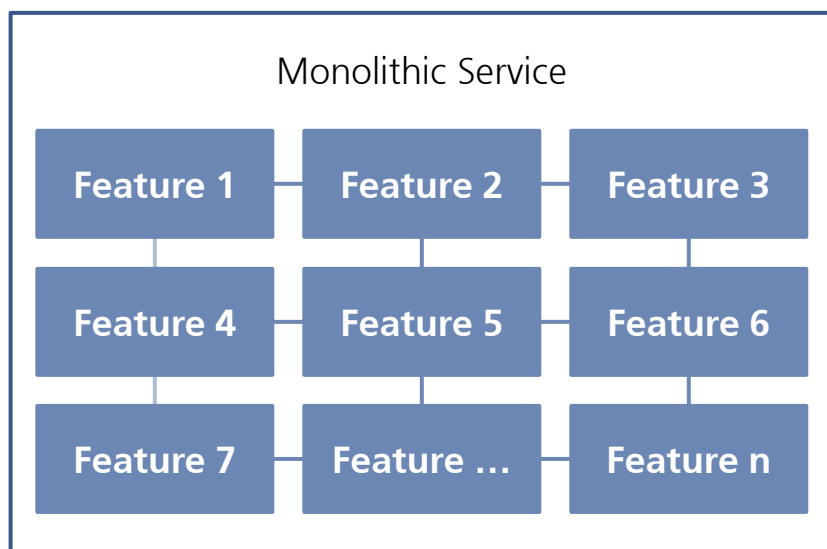
- ▶ Transaction record through entire lifecycle
- ▶ Distributed, P2P actions, no intermediaries
- ▶ Massive reduction in speed/cost of processing
- ▶ Secure through network validation

Future opportunities

- ▶ Large efficiencies in middle/back-office
- ▶ Automatic execution, settlement and payment
- ▶ Risk Management (Counterparty, Macro events, etc)
- ▶ New revenue lines/roles
- ▶ Reduced regulatory reporting

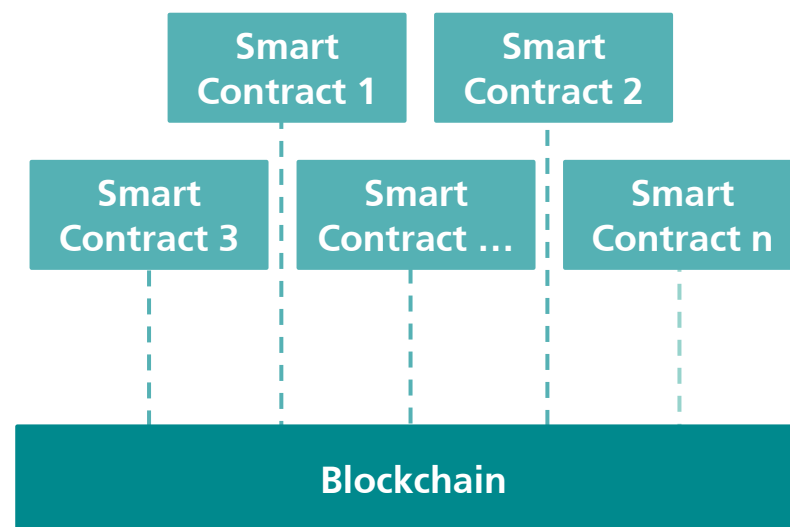
Advantages of blockchain micro-architecture

Traditional Architecture



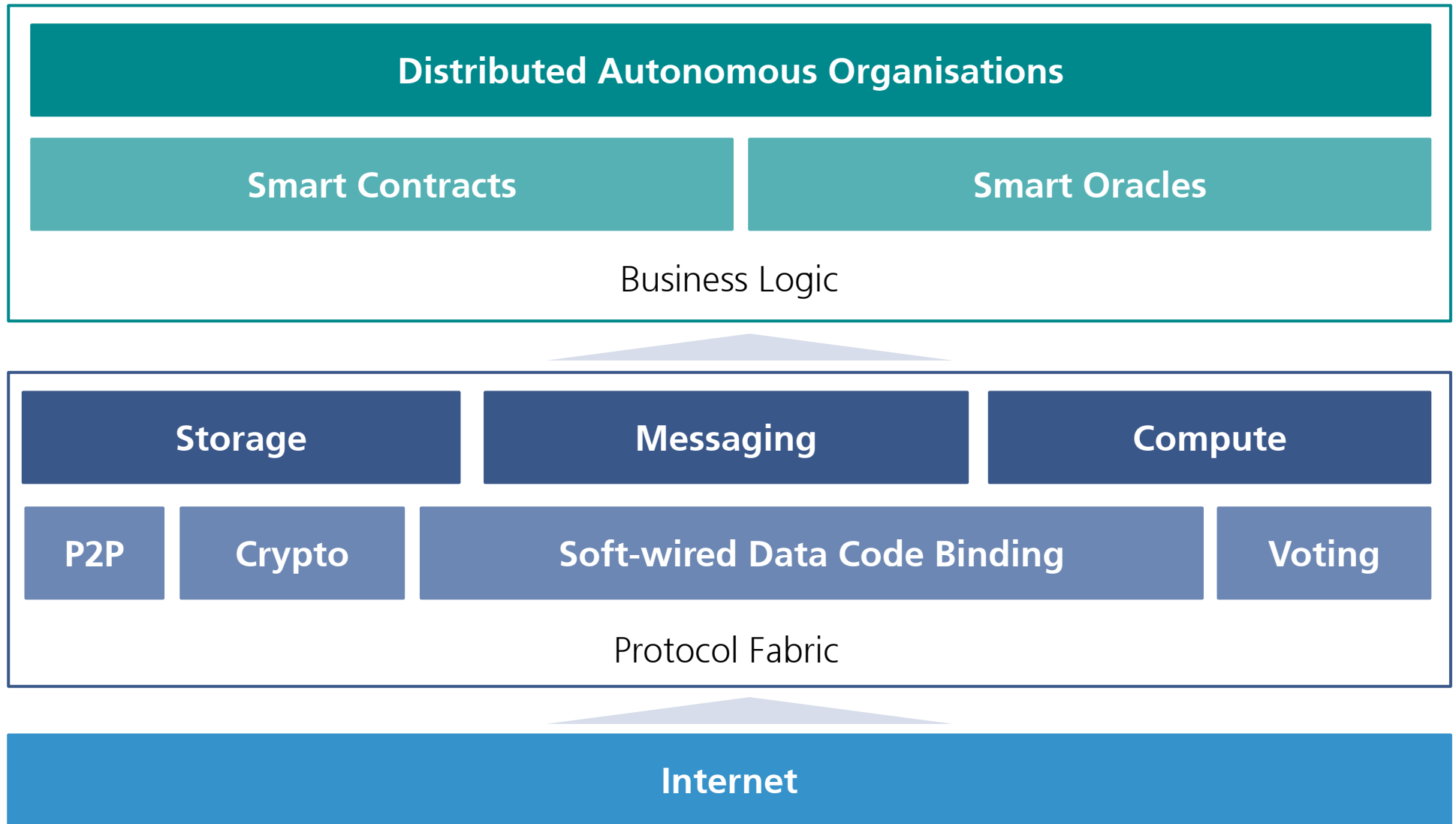
- ▶ Creating trusted services require large investment in infrastructure and technical expertise.
- ▶ In order to reduce the cost of developing and running multiple trusted services we created "monolithic" services with multiple interconnected features.
- ▶ Disadvantages of monolithic architecture are high fix cost and large risks in replacing / decommissioning a service or part of it.

Blockchain micro-architecture

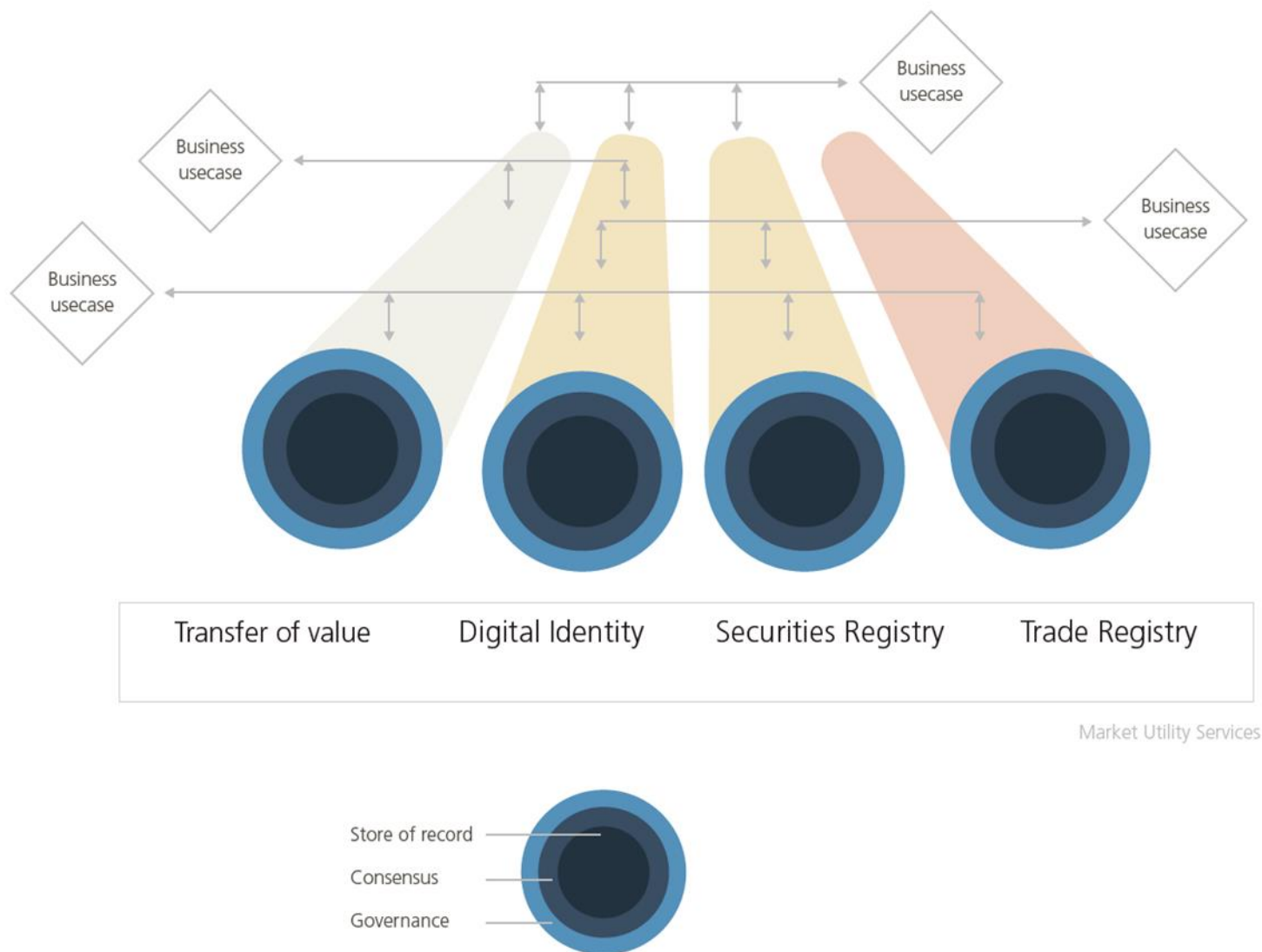


- ▶ Because smart contracts are based on a common trusted platform (i.e. blockchain) we can in principle adopt micro architecture, which leads to easily swappable components, reducing risk and costs.
- ▶ Blockchain and smart contracts allow for a lighter architecture with "plug-n-play" capabilities.

Hypothetical operating model



A new approach for a common market fabric

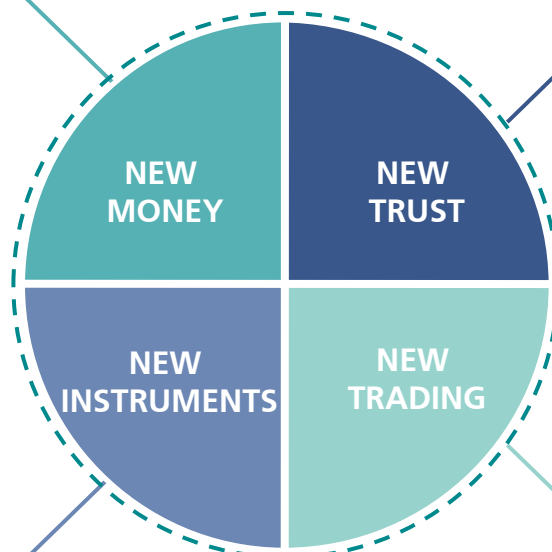


*For illustrative purpose only

Hypothetical Business Model

New Money

- ▶ Alternative money creation
- ▶ End of debt depended money creation?



New Trust

- ▶ Platforms not organisations
- ▶ Financial API
- ▶ Democratic Access
- ▶ Unbundle
- ▶ Economies of Scale benefit?

New Instruments

- ▶ Autonomous escrow agents
- ▶ Self-servicing
- ▶ Immutable depository
- ▶ No reconciliation leads to instant settlement
- ▶ New trading patterns?

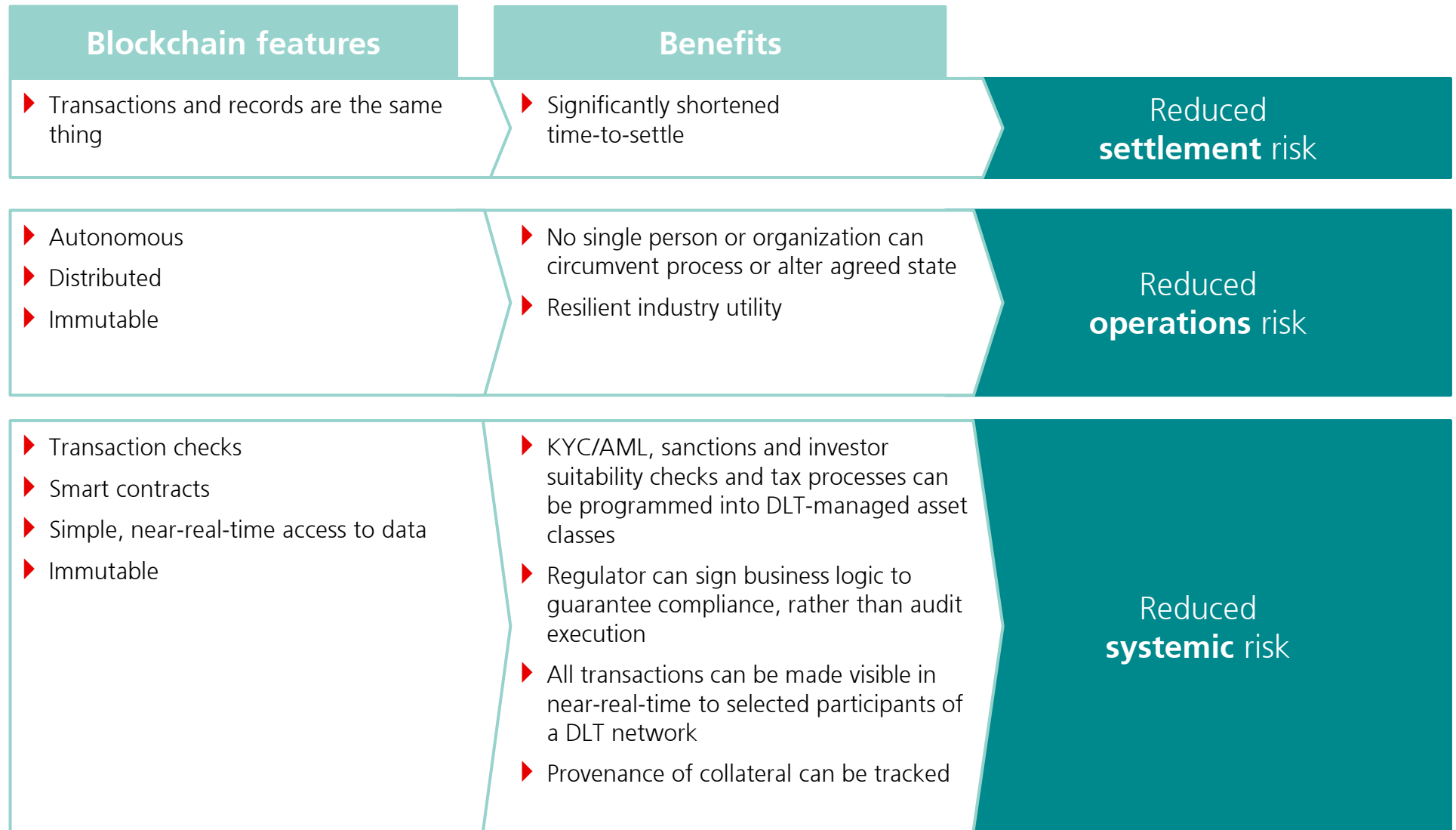
New Trading

- ▶ Poor TPS and Latency
- ▶ Distributed Order Book matching
- ▶ Self-negotiating instruments
- ▶ Centralised exchange required?

Blockchain potential for State, Banks and Clients

	State	Bank	Client
Distributed	Reporting could become bi-product of doing business	No single point of failure solution	Possibly cheaper and open to competition
Autonomous	Regulatory compliance could be guaranteed by crowd executed code	Could reduce market participation costs and reduce risk of fraud	Possibly cheaper and safer financial transaction services
Automated	Could be used to automate business administration tasks like tax collection	Could reduce incidents of fails and associated manual intervention costs	Possibly cheaper and more reliable services also automating clients' administration tasks
Real time	Offers possibility of real time systemic risk analysis	Opportunity to improve liquidity management and collateral efficiency	Could reduce risk, improve capital efficiency and access to operating assets

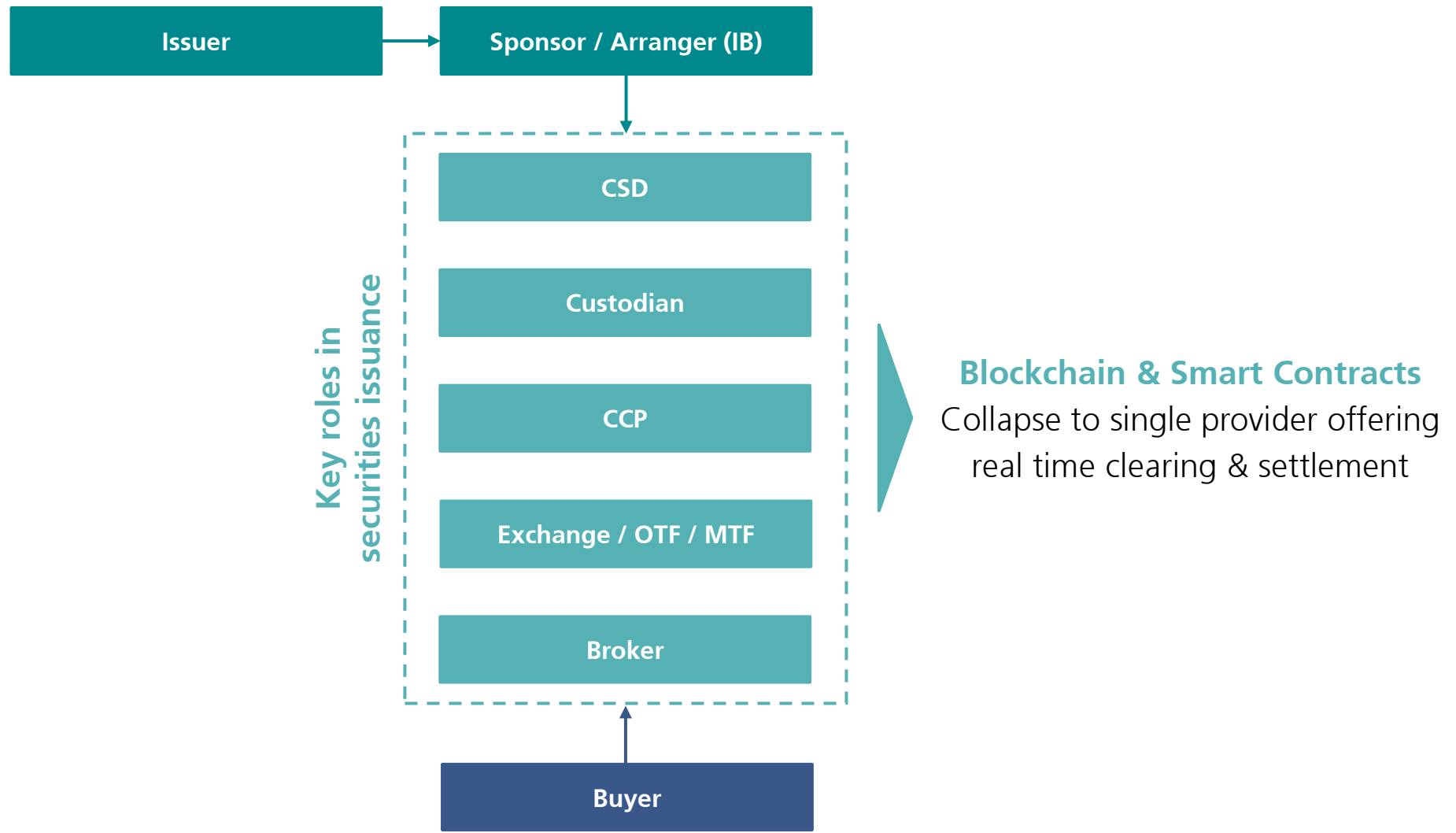
Blockchain potential to reduce risk



Cost and risk reduction potential roadmap for regulated markets

Cost and risk reduction	Short term	Medium term	Long term
IT	Medium	High	High
Operations	Low	Medium	High
Intermediation	Low	Medium	High
Capital	Medium	High	High
	Blockchain systems run in parallel with current systems with no updates to current regulations	Regulations adapt and some asset classes are now on blockchain with near real time clearing and settlement	Regulator inclusive transition of majority of systems to blockchain with automated KYC, AML, compliance and reporting

Securities issuance on blockchain



Smart Bond - Overview

Use Case Description and Objective

- ▶ Use blockchain to streamline the issuance of bonds and the management of the following life-cycle events.
- ▶ Validate initial hypothesis on the suitability of blockchain technology for clearing and settlement of standard financial instruments.

Current Solution

- ▶ Multi-step process between issuer, bank and investor to build prospectus and book.
- ▶ Pre and post trade intermediaries involved in the process, determining settlement delays and additional fees.

Current Problems

For clients

- ▶ Complex and expensive administration, especially for small bond issues.
- ▶ Slow process for issuance and interaction with investors.

For UBS

- ▶ The involvement of multiple intermediaries determines failures and settlement risk.
- ▶ Lower margins due fees paid to intermediaries.

Blockchain Solution

- ▶ Issuance of smart bond and indication of interest published and recorded on blockchain.
- ▶ Asset-backed crypto coins used to exchange value (able to implement smart escrow contracts).
- ▶ Real time clearing and settlement and automated servicing of coupon and maturity payments.

Potential Benefits

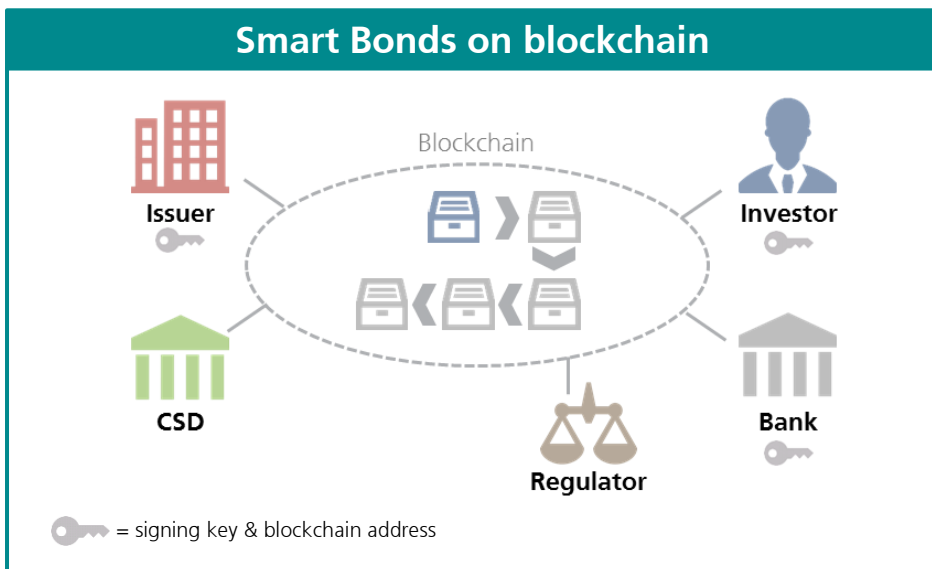
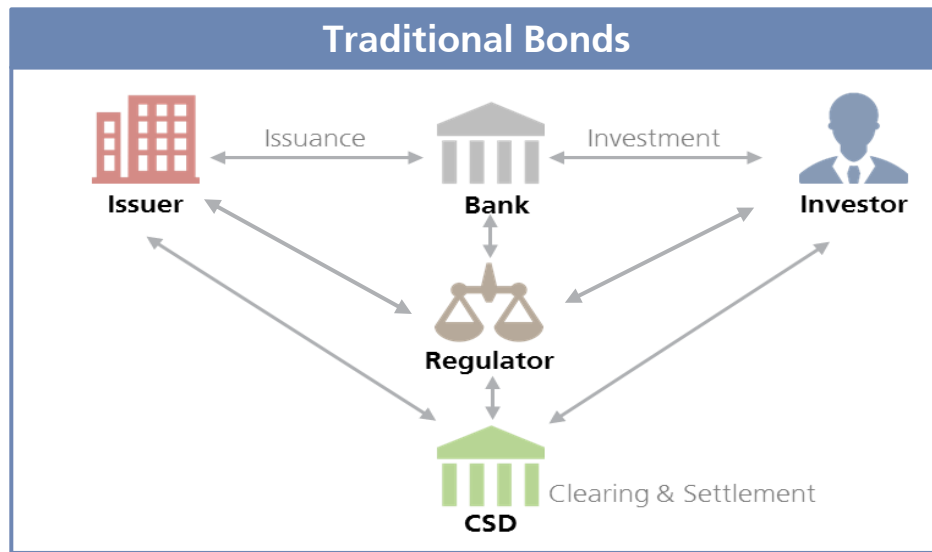
For clients

- ▶ Much cheaper platform to issue bonds, lower admin cost enables a lot more smaller issues than before.
- ▶ Increased transparency.
- ▶ Increased speed of issuance and investor response.

For UBS

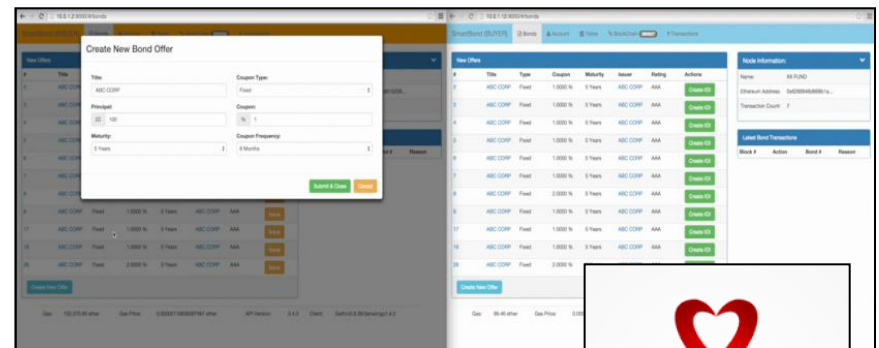
- ▶ No point of failure and reduced risk from real time clearing and settlement.
- ▶ Better margins through circumvention of custody services and lower servicing (coupon payment) costs.
- ▶ Regulatory reporting to become by-product of doing business if regulator joins network.

Smart Bonds – Incubation Results



PoC Incubation Results & Learnings

- ▶ PoC application built on Ethereum by the Crypto 2.0 Lab.
- ▶ Successfully modelled bond issuance, purchase, coupon and maturity payments life-cycle events all with near real-time clearing and settlement.
- ▶ Developed our first utility coin, the "BondCoin" to exchange value between the issuer and the buyer.
- ▶ Ethereum has a lot of potential but still limited development tools and no scheduler.
- ▶ Needs development on scalability – widely seen as area for quick evolution (i.e. next 12 months).
- ▶ Experiment learnings contributed to HEAL Bond project for HIV cure fund raising.



Strategic learnings from research and experiments

Current Challenges

- ▶ The technology needs further developments to ensure adequate **speed and scalability**
- ▶ Technology standards need to be adopted, ideally within an **open source framework**
- ▶ **Strategic architecture** needs further exploration
- ▶ Despite growing interest from Regulators and Central Banks, the **legal framework is still unclear**
- ▶ Transactions finality can't be achieved on chain without the introduction of "**crypto cash**", FIAT currency on blockchain
- ▶ **Digital identity** on blockchain needs to be addressed to ensure compliance with KYC and AML regulations

Potential benefits

- ▶ **Truly real time transactions** allowing risk reduction and better capital management
- ▶ **Truly distributed ledger and execution** allowing significant reduction of risk and cost due to intermediation
- ▶ **Improved regulatory effectiveness**, with KYC, AML and real time transaction checks embedded on blockchain
- ▶ **Smarter and cheaper financial services** for our clients, able to improve financial inclusion
- ▶ Huge potential for **green field initiatives**, such as new asset classes and smart products
- ▶ Huge potential for **integration with other emerging technologies**, such as AI and IoT to implement the future of finance