

PROS AND CONS OF BLOCKCHAIN IN CAPITAL MARKETS

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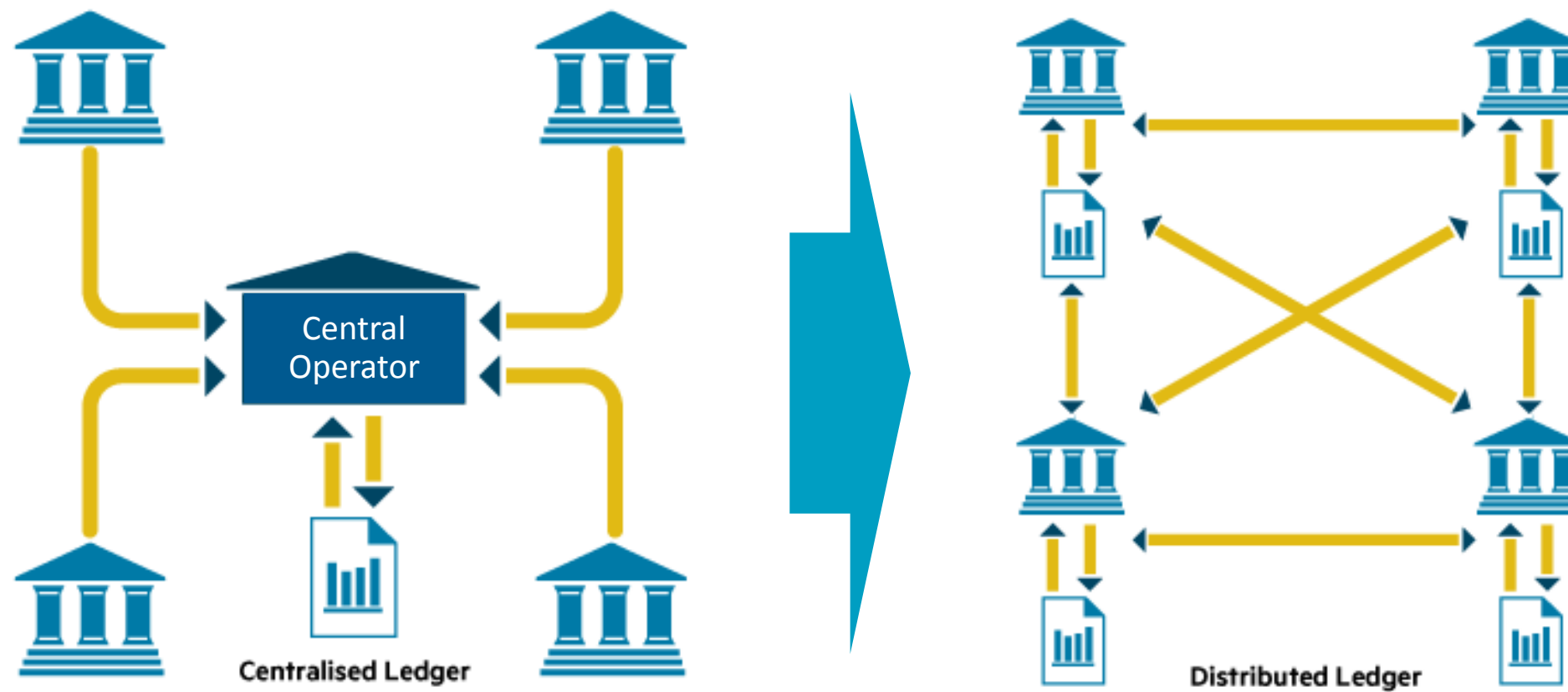
SOLVING THE PROBLEM OF DOUBLE SPENDING



- Digital data = Copyable
- This is a feature for digital content, but a bug for digital assets: if a photo is copied and shared, that's great; if a dollar is copied, it breaks the currency
- AKA the “double spending” problem
- Thus, traditionally, the only way to transfer an asset digitally was to entrust an intermediary to control the records

Source: chain.com

A NEW APPROACH FOR FINANCIAL MARKETS



Blockchain
-> The Internet of Value <-

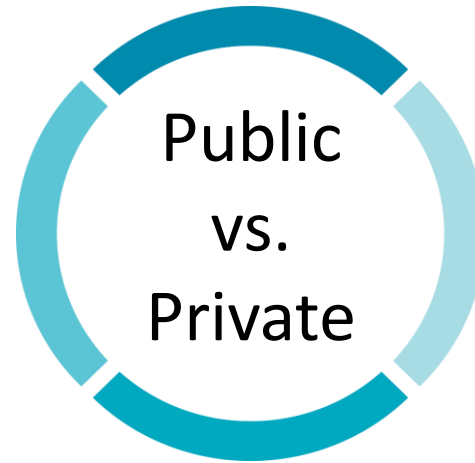
A NEW MEDIUM FOR TRANSFERRING ASSETS

- Can save major financial institutions billions of dollars on the cost of settling trades and other financial transactions
- Brings robustness, transparency and innovation together to transform the marketplace
- Improve efficiency and reducing errors within your business
- Applies to a wide variety of use cases
 - Currencies, P2P lending, medical data records, mortgage loans, SIM cards, etc
- Our focus primarily on post trade
 - Securities registrar, immediate settlement, securities lending, collateral mgmt, corporate actions, investor services etc.

THERE ARE DIFFERENT KINDS OF BLOCKCHAINS

Public Blockchains

- ▶ Open Internet
- ▶ Many miners / independent nodes
- ▶ Any and all can join the network
- ▶ High complexity / difficulty in verification process
- ▶ Independent nodes provide full auditability



Private Ledgers

- ▶ Restricted Network
- ▶ Centralized mining / limited nodes
- ▶ Participants must be permissioned
- ▶ Lowered complexity / quicker verification
- ▶ Requires trust of the node operators and/or third party verification

FINANCIAL INDUSTRY MOVING FAST

- ▶ > 1B USD in venture capital invested since 2012
- ▶ World Economic Forum believes 10% of global GDP will be registered in blockchain by 2025
- ▶ More than 50 banks in a blockchain consortium for how to tap into the blockchain technology. Pilot case launched in January 2016
- ▶ Linux Foundation unites industry leaders to advance the blockchain technology
- ▶ Exchanges and Clearinghouses invest and pilot on several initiatives
- ▶ Heavy focus on clearing/settlement with clear synergies also in the derivatives clearing

WHERE CAN DISTRIBUTED LEDGERS BE USEFUL?



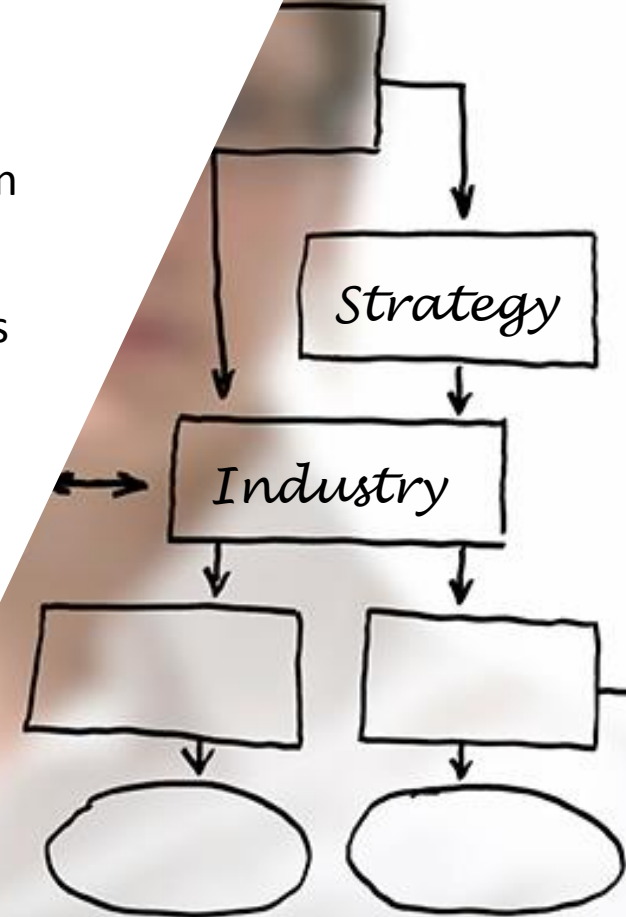
This technology is good at keeping track of possession of any digitized asset.

PILLARS OF INTEREST FOR THE FINANCIAL INDUSTRY

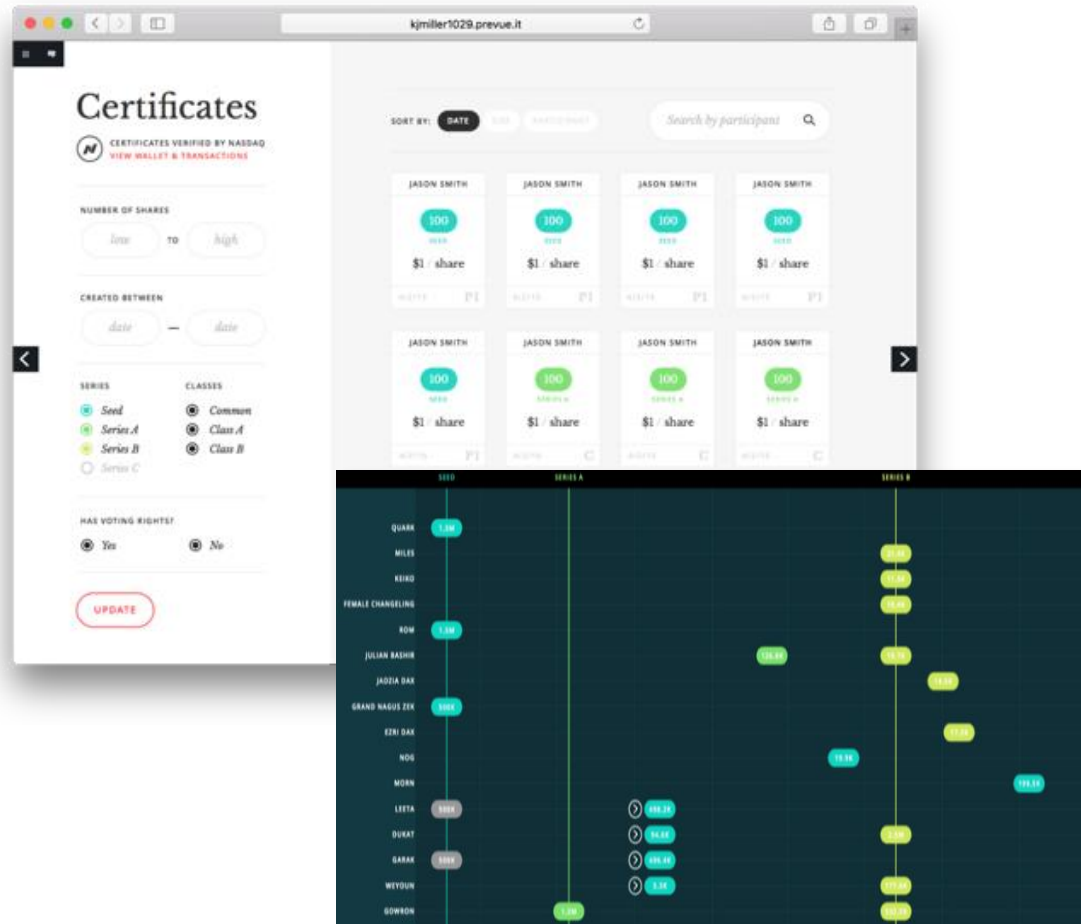


NASDAQ STRATEGIC DIRECTION

- ▶ Full senior management commitment
- ▶ Initial blockchain offering launched to the market in 2015, i.e. Nasdaq Linq
- ▶ Continued strong focus on investment and evolution of our blockchain technology into more tangible assets during 2016
- ▶ Several projects now ongoing within our own clearinghouse as well as with external customers, to develop and launch BC enabled business applications on our core framework
- ▶ A global play where major benefits occur through collaboration between major marketplaces
- ▶ Market Technology well placed with more than 80 marketplaces running on our framework



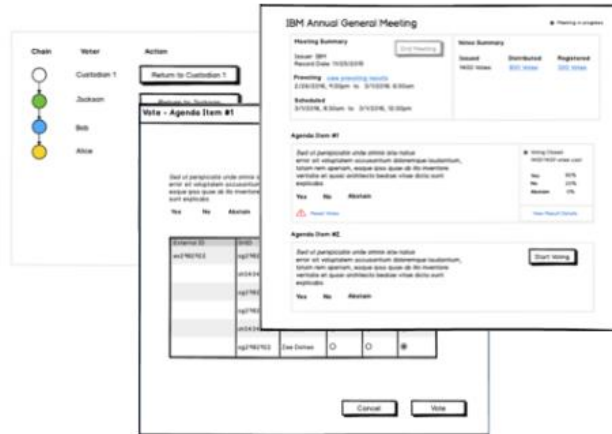
NASDAQ PRIVATE MARKET - LINQ IN PRODUCTION



“Enables First-Ever Private Securities Issuance Documented With Blockchain Technology”

- ▶ A Blockchain-enabled platform for managing electronic records of ownership in privately issued securities
- ▶ Issuance and immediate transfer of shares without CSD or CCP
- ▶ Complete historical record, increased auditability
- ▶ Cap table management interface to blockchain
- ▶ Will support liquidity events through integration with bank partners

NASDAQ PROXY VOTING SECOND OFFICIAL PROJECT



“Nasdaq is to use blockchain technology to streamline proxy voting on companies listed on the Tallinn Stock Exchange”

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We are going to put proxy voting on the blockchain, on the immutable ledger and obviously enable people to do that with their cell phone and have that record with them forever.”

- Nasdaq CEO Bob Greifeld in Bloomberg, Oct 2015

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- ▶ Streamlined service for proxy voting
- ▶ Votes will be tracked stored in the immutable ledger
- ▶ Digital authentication to onboard users
- ▶ Issue and record votes on the blockchain

MORE USE CASES BEING WORKED ON AT NASDAQ

Registrar services of assets onto a shared ledger

Issuance, custody and settlement services for bi-lateral agreements

Corporate actions and dividend payments onto the ledger

Tri-party collateral management services over a shared ledger

Securities lending for CCPs with atomic swap of securities, money and positions

Movement of CCP trades and positions to a shared ledger

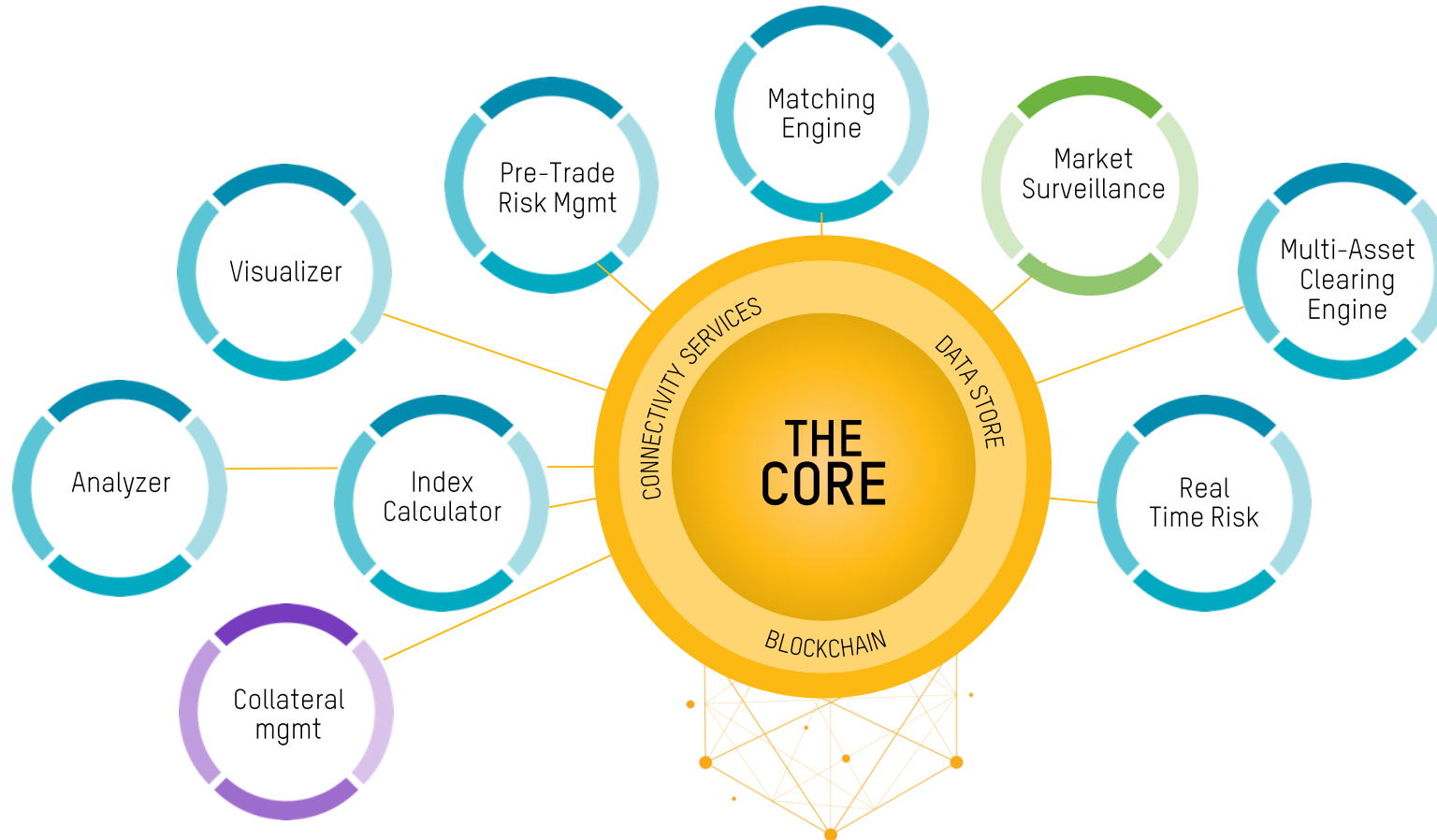
Clearing interoperability for multiparty clearing services

Member safekeeping services of securities over a shared ledger

Repo market solution through smart contracts

NASDAQ FINANCIAL FRAMEWORK

ENABLED FOR BLOCKCHAIN BUSINESS



 Nasdaq-built applications  Blockchain -integrated application  Application leveraging Machine Intelligence  Third-party applications

HURDLES TO WIDE-SCALE ADOPTION OF BLOCKCHAIN TECHNOLOGY IN CAPITAL MARKETS

It will take some time before we see a wide scale adoption of blockchain technology in large scale capital markets.

Transitioning existing structures into new blockchain based models will be very difficult

Near-term commercial opportunities are likely to arise in markets where the hurdles to wide scale adoption are not prevalent.

Markets with weak- or lacking trusted third part structures may be easier to address.

BLOCKCHAIN - THE CATALYST FOR CHANGE

- Blockchain promises operational and capital efficiencies, but more interestingly new business models
- Financial industry needs to consider regulations and legislations
- Smaller markets / regions more likely to change first

THANK YOU

