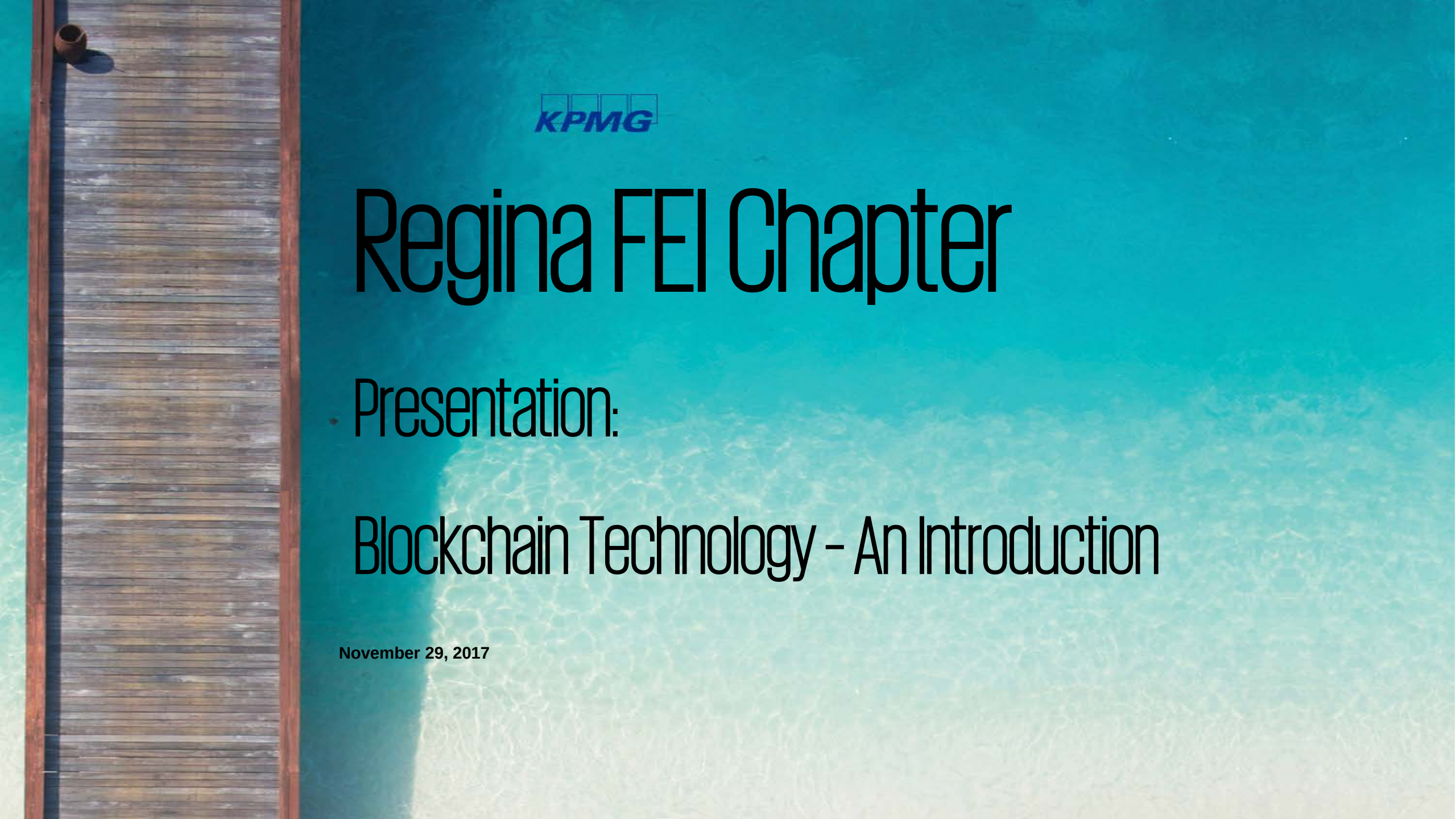


Regina FEI Chapter

Presentation:

Blockchain Technology - An Introduction

November 29, 2017

Discussion Objectives

This session will provide a plain language (i.e., non-technical) introduction to blockchain and discuss its current and potential future uses.

To do so, this presentation will focus on the following areas:

- ✓ Share information related to blockchain technology – i.e., what is it, what are the benefits?
- ✓ Discuss blockchain's application in the context of financial services (the most common usage to date)
- ✓ Discuss blockchain's challenges

Introduction to Blockchain

What does blockchain mean?

Blockchain is the common name for a **distributed ledger technology (DLT).**

Information held on a blockchain exists as a shared — and continually reconciled — database.

To help conceptualize a basic understanding of the blockchain :

- picture a spreadsheet that is duplicated thousands of times across a network of computers
- imagine that this network is designed to regularly update this spreadsheet

What problem is blockchain trying to solve?

Blockchain is trying to solve the problem of sharing transactional information in real-time, without update delays or having to block user access.

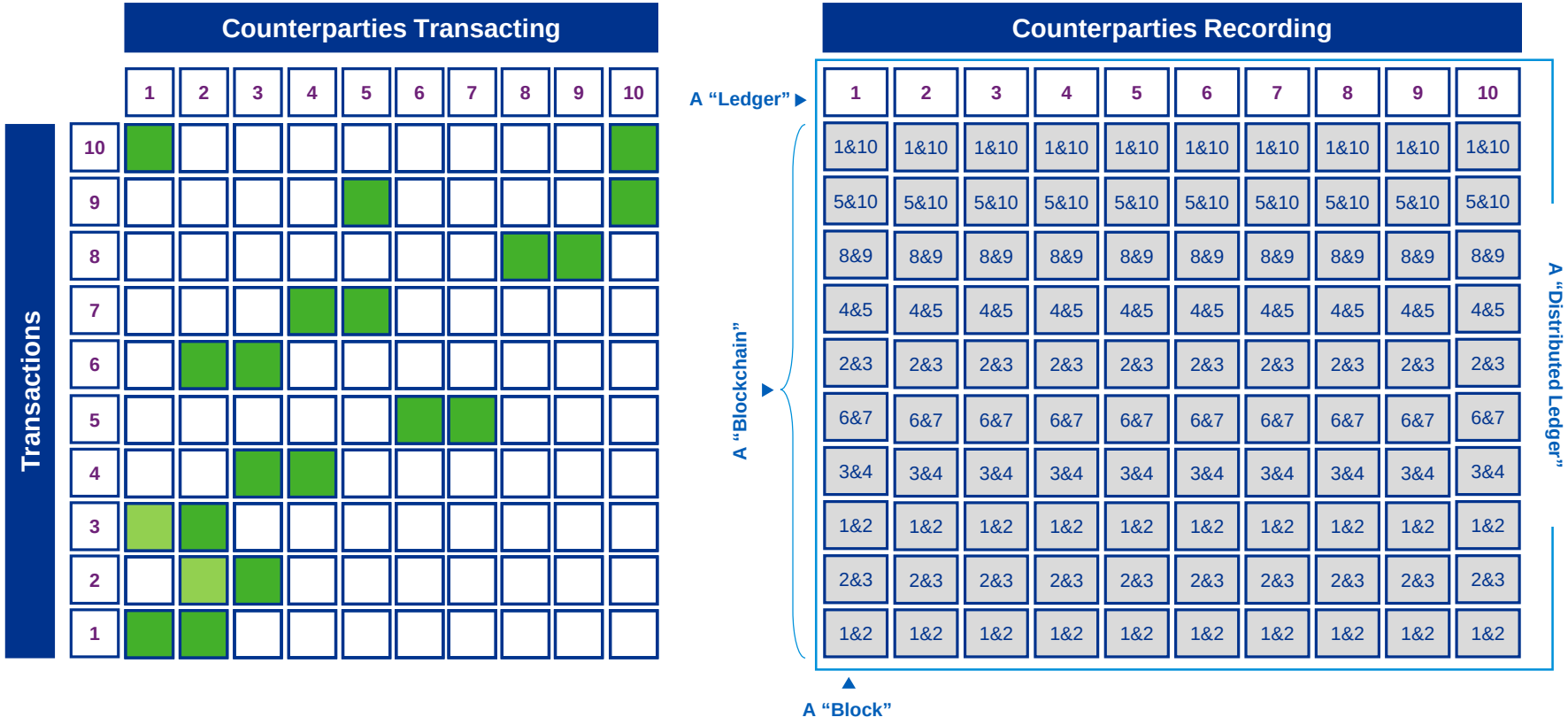
Consider a document sharing example:

- You and a college need to work on a single document
- You email it back and forth and wait for each other
- If someone makes a mistake, it's hard for the other to catch it

What is a "block", "blockchain", or distributed "ledger"?

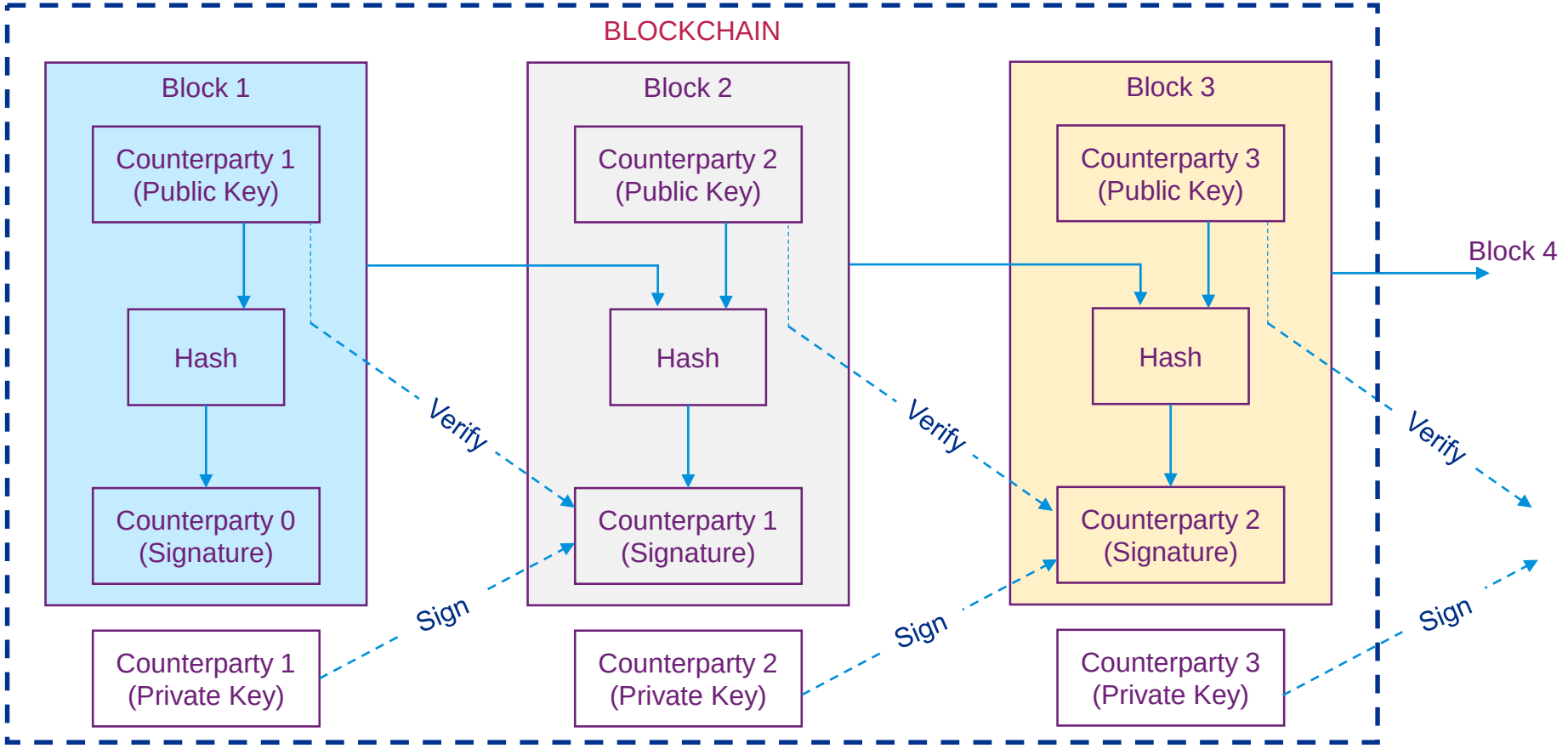
A blockchain is a *permanent record of transactions* in a network. The system is protected by using a reference to the previous block (*"hash"*), which is encrypted.

Breaking into the system would be so evident that any illegitimate changes to the system can be detected and cancelled.



How does blockchain work?

A blockchain is a permanent record of transactions in a network. The system is protected by using a reference to the previous block ("hash"), which is encrypted. Breaking into the system would be so evident that any illegitimate changes to the system can be detected and cancelled.



DLTs are an architectural concept

The concept of a distributed ledger (DLT) was synthesized in 1990. Blockchain was introduced as a distributed ledger platform for the Bitcoin application as the ultimate incarnation of a decentralized ledger by anonymous consensus.

The spectrum of available distributed ledger technology aims to solve the problems of data redundancy and costly reconciliation processes with unique organizational models and consensus procedures.

DLTs are a way of ordering and verifying transactions in a distributed ledger.

1

Initiate transaction:

- Multiple parties transact.
- All transactions are recorded including transaction's date, time, parties and amount wants to do a transaction.

2

Post and Record transaction to the network:

- The transaction is added in order into a network's 'block' and presented.
- Entries can be added but not deleted.
- Each node in the network owns a full copy of the ledger.

3

Broadcast:

- The 'block' is broadcasted to every party and their nodes in the network.
- Network of computer nodes verifies and validates by running a software that continuously replicates the ledger.

4

Validate via Consensus and confirm:

- The network verifies, validates, and approves; the confirmation is broadcast to the other nodes.
- Consensus (agreed mathematical mechanism) is recorded and provides the basis for trust mechanism.

5

Immutable, encrypted block:

- The confirmed block is added in a linear and chronological order to the chain.
- That provides a transparent record of transactions; Audit trail and traceable digital fingerprint.
- Data is pervasive and persistent and creates a reliable transaction record.

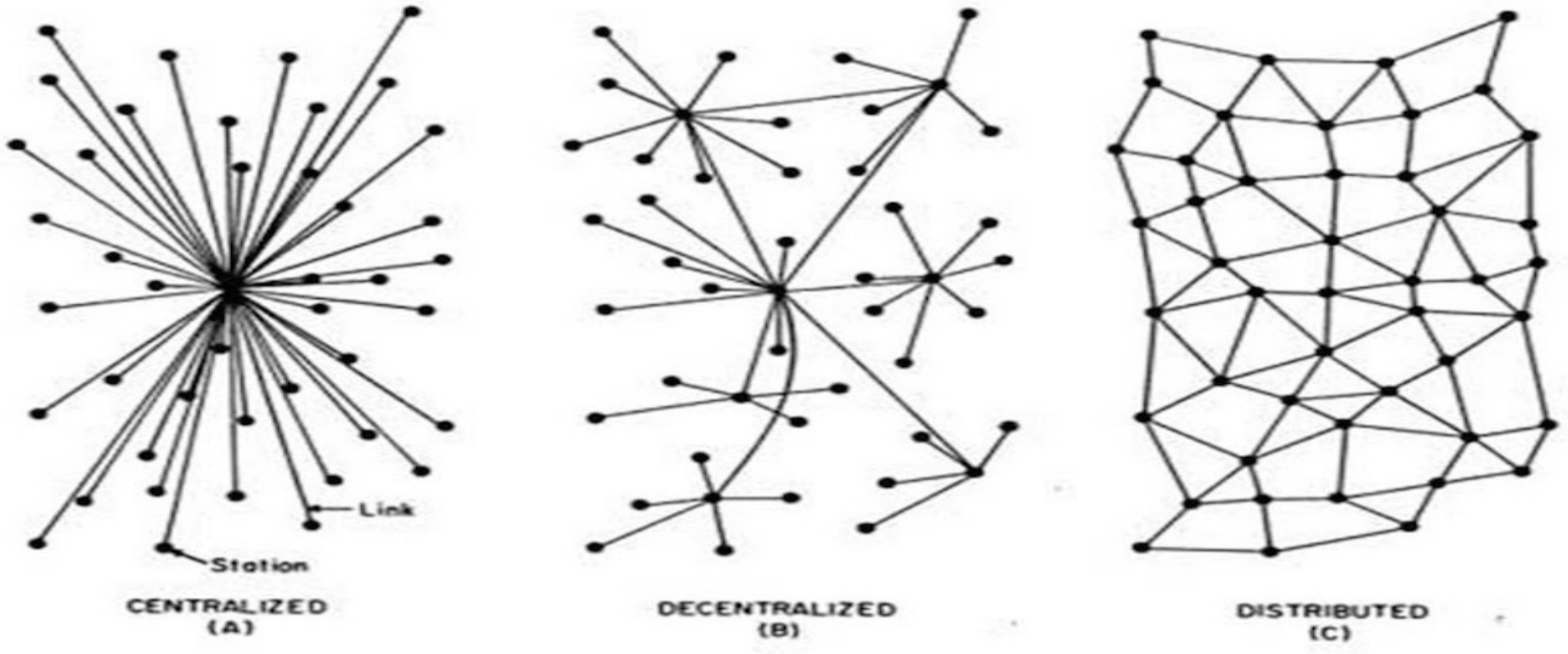
6

Transaction completed:

- Nodes have access to a shared single source of truth.
- A completed block gives way to the next block in the blockchain.

Why does it matter if ledgers are distributed?

The key to a DLT is not just that it has no central point of failure, but that everyone participating has full transparency to all transactions all the time.

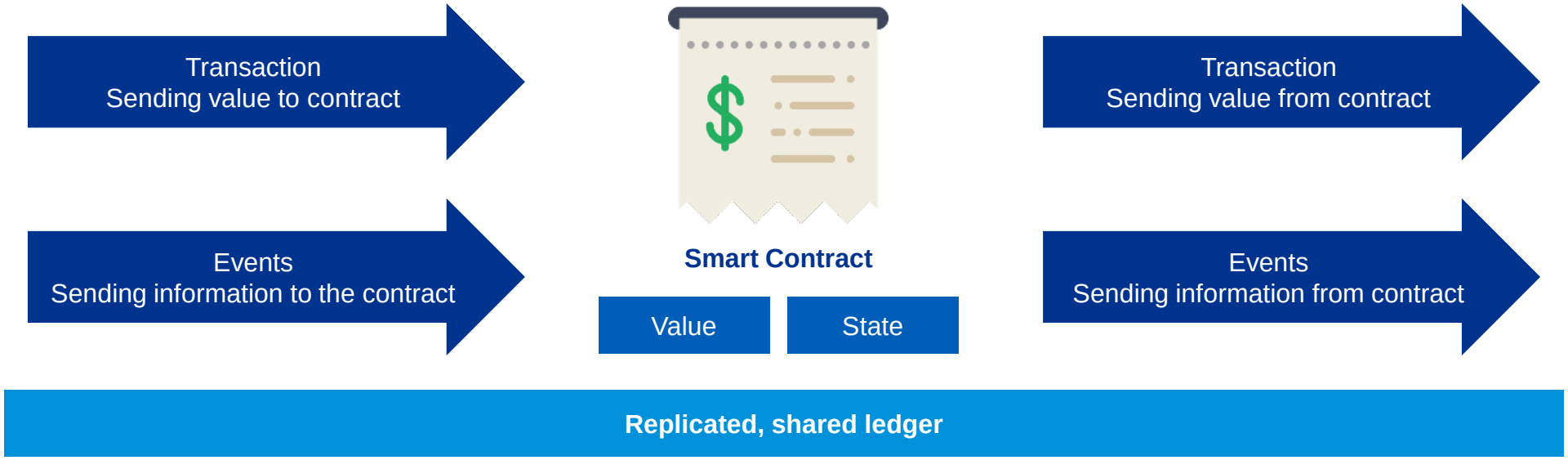


What are smart contracts?

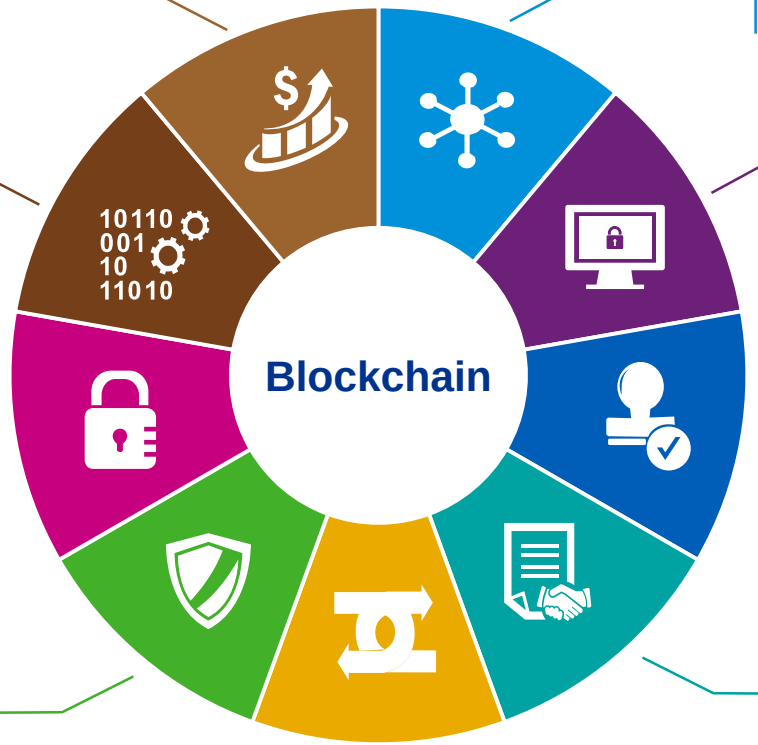
Smart Contracts are self-executing protocols that work with a distributed ledger to enforce performance of contracts with certainty and resilience. Triggered by an event, the code in the distributed ledger automatically executes the fulfilment of a previously agreed arrangement:

— Eliminates the risk of delays and reliance on middlemen to follow through on their commitments.

— Information sharing is transparent, time-stamped, and irreversible .



What are the features of blockchain?



STP
Straight-Through-Processing benefits

Programmable
A blockchain is programmable ("Smart Contracts").

Secure
All records are individually encrypted.

Immutable
Any validated records are irreversible and cannot be changed.

Trust
They do not need another intermediary to guarantee the other parties.

Distributed
All network participants have a full copy of the ledger for full transparency.

Anonymous
The identity of participants is either pseudonymous or anonymous.

Time-stamped
Transaction time stamp is recorded on a block.

Consensus
All network participants agree to the validity of each of the records.

Source: KPMG Research

What are the benefits of blockchain?

Blockchain is a way of using the network that has many benefits:

- *No single point of failure* - the blockchain database isn't stored in any single location, meaning the records it keeps are truly public and easily verifiable.
- *Resistant to hacking* - No centralized version of this information exists for a hacker to corrupt.
- *Transparent* - Hosted by millions of computers simultaneously, its data is accessible to anyone on the internet.

What are the benefits of blockchain? (cont'd)

Quantitative benefits

INCREASED Efficiency

20%–40%

STP and digitization benefits. Increased efficiency from single source of truth.

REDUCED Capital consumption

0–75%

Quicker settlement of trades and STP benefits. Reduction of op risk capital requirements.

Revenue ENHANCEMENT

0–25%

Better customer experience, faster processing and digital channels. New markets.

Loss REDUCTION

85%–95%

Reduced reconciliations and errors. Redeployment of resource to most complex cases.

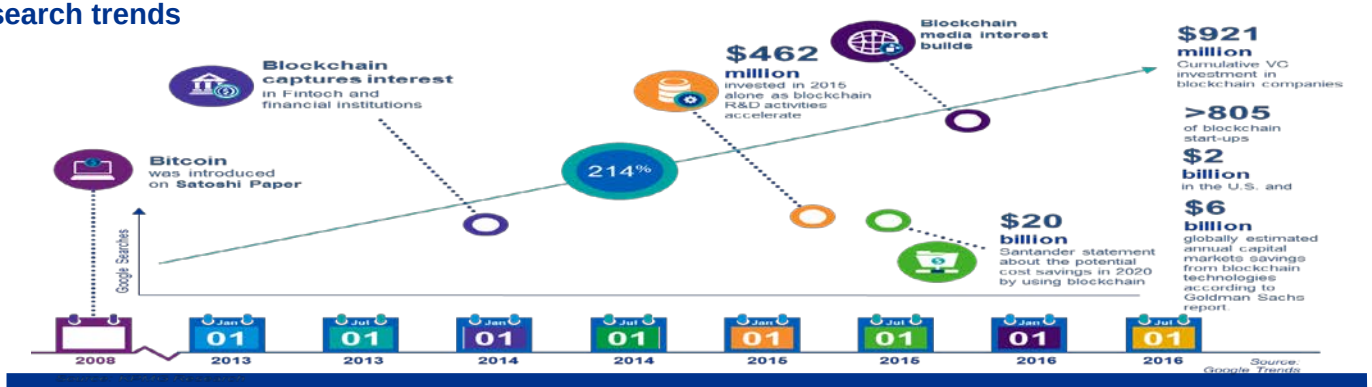
Qualitative benefits

1. **Compliance through audit trail**
2. **Transparency of history of events ("one truth")**
3. **Immutability – Data stored cannot be changed**
4. **Introduction of unprecedented cohesion to internal record-keeping process**

Current Blockchain Applications

Market interest in blockchain is well established

Google search trends



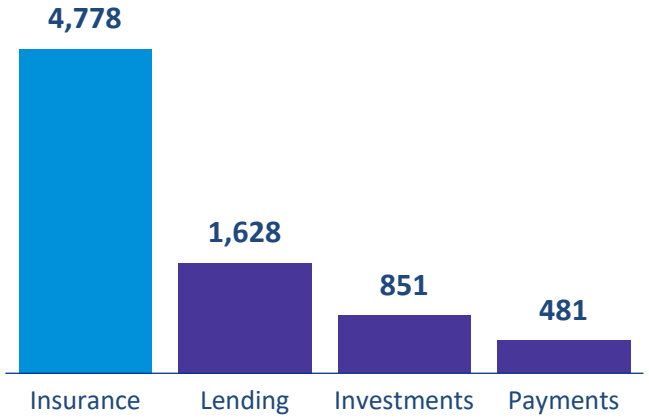
Key Financial Firms Investment into Bitcoin & Blockchain Startups

Over 40 financial services firms or their strategic investment arms have invested in a blockchain or bitcoin-specific startup since the start of 2014 The following graphic is updated as of October 20th, 2016.

Financial services industry is ripe for Blockchain technology

Insurance represents the greatest long-term opportunity for disruption…

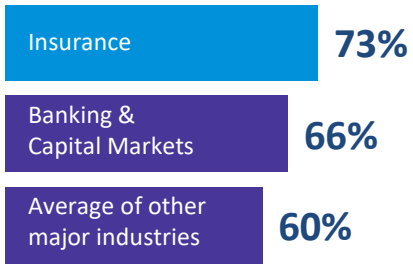
While fintech disruption has made the most headlines, insurance may be at risk for greater disruption:



Global Revenue Pools ($B)

…and CEOs know it.

Insurance CEOs are more concerned about disruption than their peers.



% of CEOs who see their industries at risk of disruption

WORLD ECONOMIC FORUM

"The most imminent effects of disruption will be felt in the banking sector; however, the greatest impact of disruption is likely to be felt in the insurance sector."

1. Source: Commerz Ventures "Emerging technologies transforming the $4Tn insurance industry" (2016)
2. See above
3. World Economic Forum "The Future of Financial Services" (2015)

"I look at how woefully we are behind in some sectors – if you order from Amazon, you get text messaged and the product is delivered to your door. We need that for our policyholders. We need new technology or we are going to be *Uber*-ized ourselves."

— **Inga Beale, CEO** LLOYD'S

Source: Property & Casualty 360

Banking & CM companies are exploring blockchain across multiple areas

Blockchain efficiencies within the Banking and Capital Markets industry span across all areas of the operating model from trading to settlement.

OTC Derivatives	A blockchain solution for executing OTC derivatives and performing reconciliations of economic terms in a more automated way (i.e. Barclay, Societe Generale, BNPP, Santander, Euroclear, others)
Payment Processing	A blockchain solution to reconcile and verify cross border payments (i.e. Santander, BAML, Visa, others) **Use case details provided later in the presentation**
Clearing and Trade Settlement	A blockchain solution for handling fund unit transfers and ownership tracking carried out between funds and investors. (i.e. Australian Stock Exchange, Euroclear, others)
Syndicate Loans	A solution to develop a blockchain backed syndicated loan trading platform (i.e. Citi, Credit Suisse, HSBC, Mizuho, others)
Digital Identities / KYC	A blockchain solution for digitizing and validating customer information (i.e. Santander, BAML, Deutsche, Visa, others)
Mortgage Settlement	A blockchain solution using smart contracts shared between sellers, buyers and/or their appointed agents which will be an end-to-end digital mortgage origination platform (i.e. Fannie Mae, HSBC, Bank of China, Sweden Land Registry, others)
Funds Distribution	A blockchain solution for handling fund orders based on distributed ledger technology and smart contracts (i.e. Funds DLT, Capital Group, Northern Trust, others)

Insurance companies are exploring blockchain across multiple areas

Blockchain efficiencies within the Insurance industry are initially targeting the settlement and operations areas

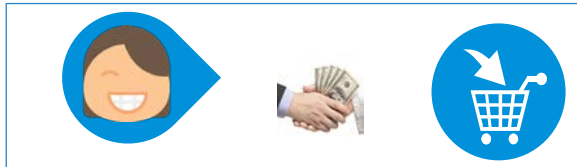
Transparent Claims Process	**Allianz** is working with Everledger to create a blockchain-based system to allow for a claim settlement process where insurance companies, owners, claimants, and law authorities can access a distributed ledger for an efficient claim-handling process.
Smart Insurance Contracts	**Allianz** is exploring smart contracts as a means to handle catastrophe swaps and bonds. The technology could boost marketability of the financial instruments that allow issuers to guard against huge potential losses following a major catastrophe and are triggered under predefined parameters.
KYC Platform	**Manulife and Lloyds –** A blockchain solution for digitizing and validating customer information where a notary networks can verify the identity of the customers and store it in a shared ledger. Any new customer coming to the network will submit his identity proof and the notary will be able to validate the data by comparing it with the government databases which will be executed outside the network (Tradle KYC solution).
Payments	**Mastercard** – Cross border B2B payments and remittances. Blockchain based payments and smart tags for predefined events under insurance policy allows for increasingly eased reimbursement experience as well as speed of funds received (Ripple payments blockchain solution).
Counterfeit Products	**Swiss company** – Counterfeit product identification and source tracing. Blockchain based solution that provides improves anti counterfeiting measures by tracking a product throughout the supply chain (Blockverify anti-counterfeit solution).
Fraud & Theft Detection	**Major insurance company** – Is looking at blockchain solution to curtail fraud with respect to insurance around asset identification, fraudulent claims submissions, fraudulent beneficiaries, among other areas (Blockverify anti-counterfeit solution).
Agent Licensing	**Insurance market –** A blockchain solution for digitizing and validating agent information where a networks can verify the identity of the brokers and agents and store it in a shared ledger in order to ensure that insurance policy are executed with valid insurance brokers who are in good standing (Tradle Smart Data solution).

Blockchain case studies or coming applications

Peer-to-Peer global payments blockchain innovation

We believe that real-time payment from person-to-person is here and will compete with the traditional payment services as it is adopted by users across the globe.

Individuals are looking for ways to send money to anyone with a smartphone or other similar devise anywhere in the world without the need for multiple intermediaries.



Digital wallets can also extend to not only sending monetary value but to purchasing goods without the need for currency or traditional credit cards.

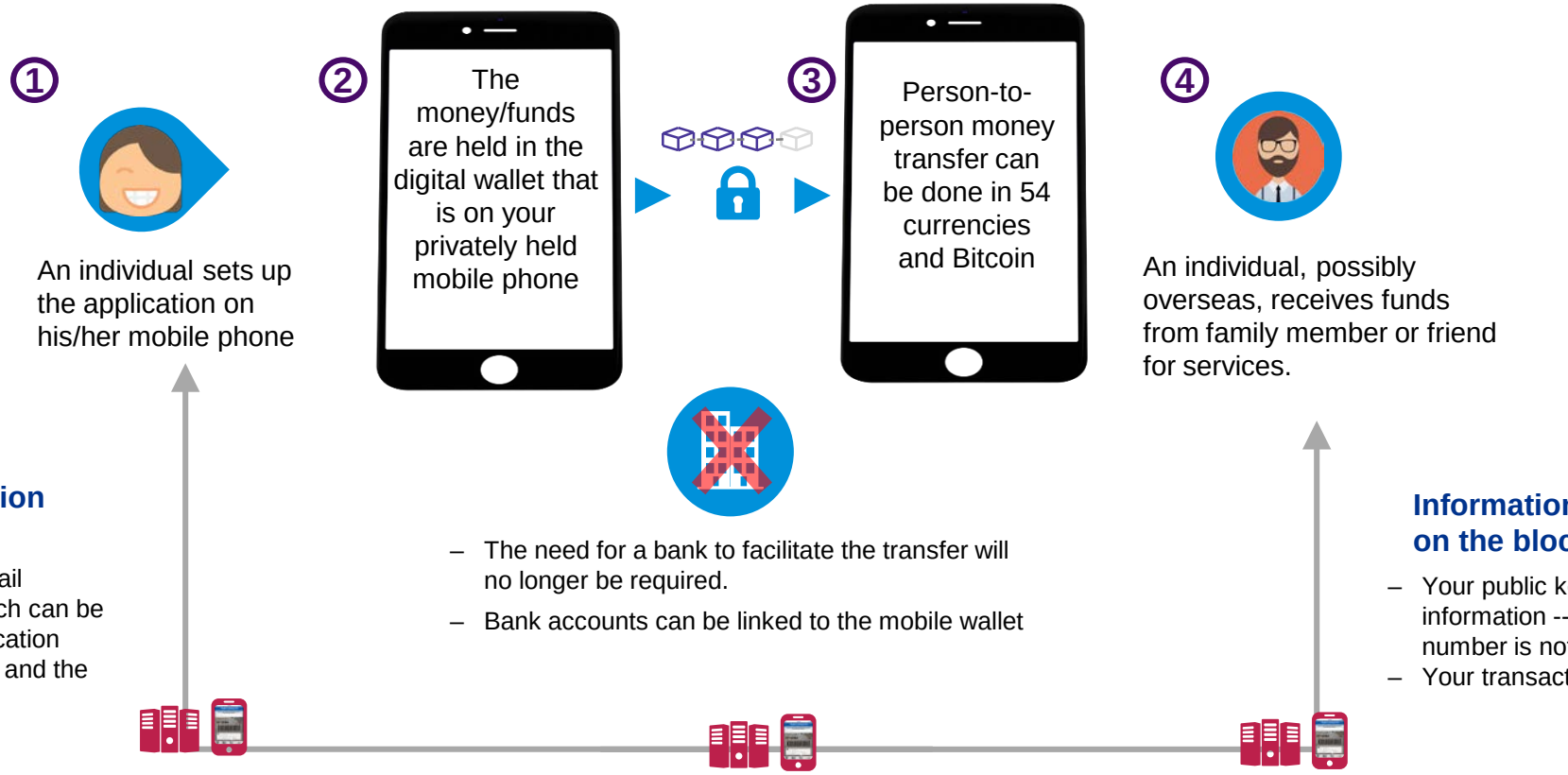
"Mobile Tellers" represent a global, shared network of banking institutions helping consumers easily deposit and withdraw cash from anywhere in the world.

- Blockchain solutions for payment will take the concept of digital cash and empower consumers to facilitate transactions among each other with limited obstacles.
- It will eliminate the need to have multiple cards and physical currency in order to make a purchase of goods, thus creating a more efficient way to facilitate person-to-person transaction of goods and services that they desire
- It will offer security and safeguard of funds as individuals will not need to carry physical currency and also protection against goods purchased with stolen credit cards and debit cards

Illustration of a global payments use case

Today there are few companies that offer the capabilities for an individual to manage and transfer funds digitally to another person.

Payment initiated and completed instantly



Information stored on Solution provider blockchain

- Your profile information (name, email address, phone number), all of which can be edited from the 'Menu' on the application
- A link between your phone number and the public key of your digital wallet(s)

- The need for a bank to facilitate the transfer will no longer be required.
- Bank accounts can be linked to the mobile wallet

Information is publicly available on the blockchain

- Your public key (though your profile information -- name, email address, phone number is not posted on the blockchain)
- Your transaction history

KYC process at Financial Institution

KYC Platform

Concept

- Client get to own their own information and transfer their KYC records as needed to service providers.

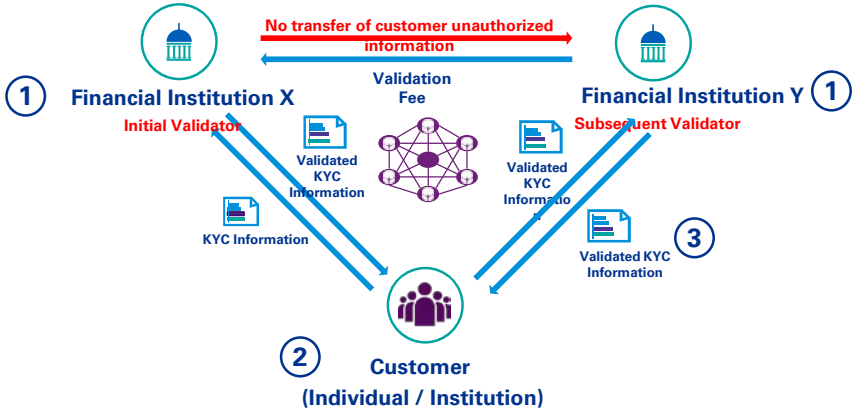
Objectives

- Digitize the current KYC processes and customer onboarding journeys across participating banks and other financial institutions
- Build high level operating model of the shared KYC platform with data protection requirements defined by regulations
- To provide KYC digitized certificates authenticating customer identity and other relevant KYC information

Onboarding Journey

Process Flows

Solution Architecture



- KYC process is different across banks and has to be repeated every time a customer opens an account with a new bank. This results in higher cost of customer acquisition, longer onboarding time and poor customer experience.
- Large institutions typically store data across a variety of databases, each one structured to optimize a specific parameter - fast updates, fast reads, analytics, storage efficiency, etc.
- Aggregating, reconciling and reporting across the data silos is expensive and resource intensive

1. **Financial Institutions** get a digital onboarding process where customer-initiated KYC portability reduces the duplication of efforts, fulfills all General Data Protection Regulation (GDPR) requirements, bypasses internal silos and legal restrictions on data movements across product or jurisdictional boundaries.
2. **Customers** get to own and transfer their KYC records, product certificates and other relationship data within and between institutions, greatly improving their experience.
3. **Regulators** are offered a standardized, real-time supervision of financial institutions, reducing the risk and uncertainty for both parties.
3. **KYC registries** get a new networked data business model that lowers the liabilities of centralized KYC repositories and enables straight through processing.

Business Case Dimension	Blockchain Advantage
Operational Efficiency	• Reduction in manual processes (e.g. manual onboarding of clients & reconciliations) increase process efficiency and FTE savings • Increased efficiencies in faster access to reliable client information for reporting and compliance monitoring
IT	• Potential decommissioning of systems or reduced operational maintenance costs due to a decrease in users or system modules

Fund distribution illustration

FundsDLT

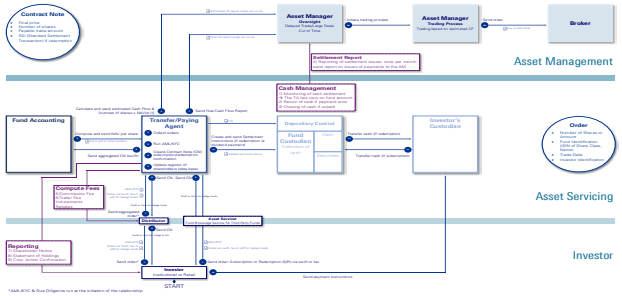
Concept

- FundsDLT is a market fund order processing engine based on distributed ledged technology and smart contracts
- Processing and decentralization of the information for market players: Asset Managers, Asset Servicers and Investors

Objectives

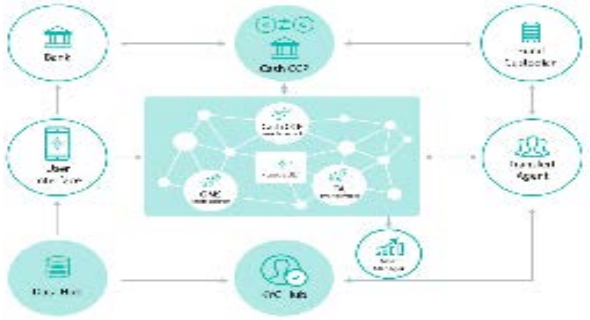
- Reduce costs of processing orders by increasing operational efficiency and mutualizing AML/KYC
- Provide an alternative distribution channel for asset managers to reach directly final investors
- The long-term goal is to popularize investment funds in the general public by making them easily accessible

Current State view: TA model



- Heavy reconciliation processes between players and inefficient data exchange result in expensive order processing system.

FundsDLT eco-system



- The DLT provides a single source of truth with no need of reconciliation and automatic exchange of data across the value chain.

Objective Type	Current State	Blockchain Advantage
Operational Efficiency	• Heavy reconciliation between Transfer Agent (TA) and Fund Custodian • Manual data exchange between TA, Fund Accountant & Custodian and Asset Manager • Duplicated AML/KYC processes across the industry	• No need for reconciliation or data exchange between parties • Sharing of effort on AML/KYC with a hub that collects all documents and share a status in the network
Business Strategy	• B2B market with product push in distribution networks • Highly intermediated value chain • Low number of transaction with large volumes (26M transactions in Luxembourg in 2015)	• Inexpensive order process makes lower volume per transaction profitable and opens the door to D2C business for Asset Managers • Disintermediation of value chain with reduced role for TA
Profitability	• Expensive process due to operation inefficiencies and intermediation	• Massive cost reduction for fund distribution (up to 70%)

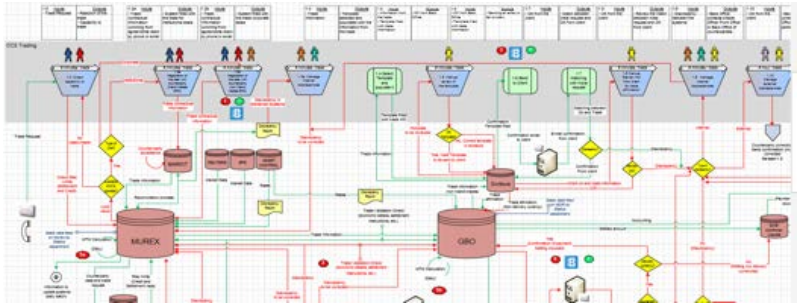
OTC derivatives cross currency swap use case example

Cross currency swaps

Selected KPMG work

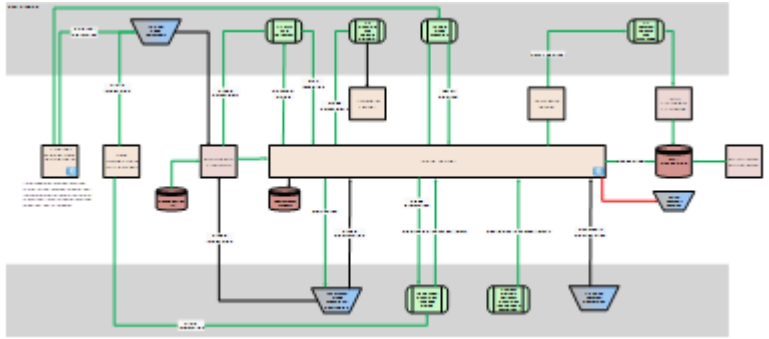
- Current state review and mapping the specific processes, system and personnel that support the activity
- Highlight process inefficiencies, pain points and opportunities as part of the current state review
- Define future state Technology Architecture with introduction of Blockchain solution
- Based on client requirements and blockchain solution parameters, define the target future state workflow design including investments in people, process and technology

Current State example



- Presence of numerous manual processes in front office and back-office resulting in wasted time, effort and numerous reconciliations

Future State (Focus of PoC)



- A number of systems, process steps and data interfaces are decommissioned and/or eliminated with the introduction of a single source of truth

Business Case Dimension	Blockchain Advantage	Benefit Metrics
Operational Efficiency	• Reduction in manual processes (e.g. manual confirmation & reconciliations) increase process efficiency and FTE savings • Increased efficiencies in Financial reporting and annual report preparation	• Operational worldwide efficiency gains: 30%
Operational Losses	• Reduction in Operational Losses (including regulatory fines) due to reduced processing, data and reporting errors	• Reduction in Operational Losses: 92%
Revenue	• Enhanced profitability due to increase in trading activity and acquisition of new clients due to better trading experience	• Revenue Increase: 0% to 10%
IT	• Potential decommissioning of systems or reduced operational maintenance costs due to a decrease in users or system modules	• TI Decommissioning related savings 25%

Other possible blockchain uses

- **Smart contracts** - simple contracts that will execute when conditions are met.
- **Crowdfunding** – direct peer-to-peer economy and economic cooperation without intermediaries
- **Government** - bring transparency to elections or any other kind of poll taking
- **Corporate Governance** - making company governance fully transparent and verifiable when managing digital assets, equity or information
- **Supply chain validation** – prove ethical sourcing claims and identify the true source of products
- **Registry information** – more efficient and secure land titles registries
- **Data and Identity management** – overcome current challenges
- Tax collection – no need to file tax returns

Blockchain Challenges

Some blockchain challenges

As many market players are avidly embracing Blockchain (BC), the benefits also come with some challenges which have to be addressed in order for the full benefits of Blockchain to be realized

Category	Challenge
Standardization	• Standardization of information and simplification of workflow supporting transactions will be required in order to maximize the benefits and ease implementation
Security	• Security of the data and information is a key concern of clients • Potential vulnerability to hackers and data breaches • BC will need to consider and meet the requirements of the privacy laws in different jurisdictions
Acceptance & implementation	• Limited market acceptance of BC across counterparties, clients, market utilities, etc. (critical mass) will potentially reduce the benefits • Implementation delays across all the different market players will result in fragmented and multiple processes
Integration into legacy infrastructure	• Difficulty, cost and timeline to integrate in legacy systems may discourage adoption • Modification of current procedures and processes • Ensuring that integration does not disrupt day to day operations

Some blockchain challenges (cont'd)

As many market players are avidly embracing Blockchain (BC), the benefits also come with some challenges which have to be addressed in order for the full benefits of Blockchain to be realized

Category	Challenge
New infrastructure requirements	• Cost and timeline of new implementation requirements may discourage adoption • New procedures and processing routines will need to be developed and implemented
Regulation	• Uncertainty around new regulations governing BC • Differing BC regulations globally may create more burdens and reduce the benefits • Integration of BC into current processes and the impact of being able to continue to meet current regulatory requirements
Training	• Lack of technical and conceptual understanding may discourage adoption • Training for staff using BC will be needed
Recordkeeping	• The move away from native files to dematerialized records will require changes in regulatory requirements

Questions?

Thank you

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