Institut des Actuaires
1st February 2017

SCOR embraces blockchain technology

Régis DELAYAT
Senior Digital Advisor to the Chairman

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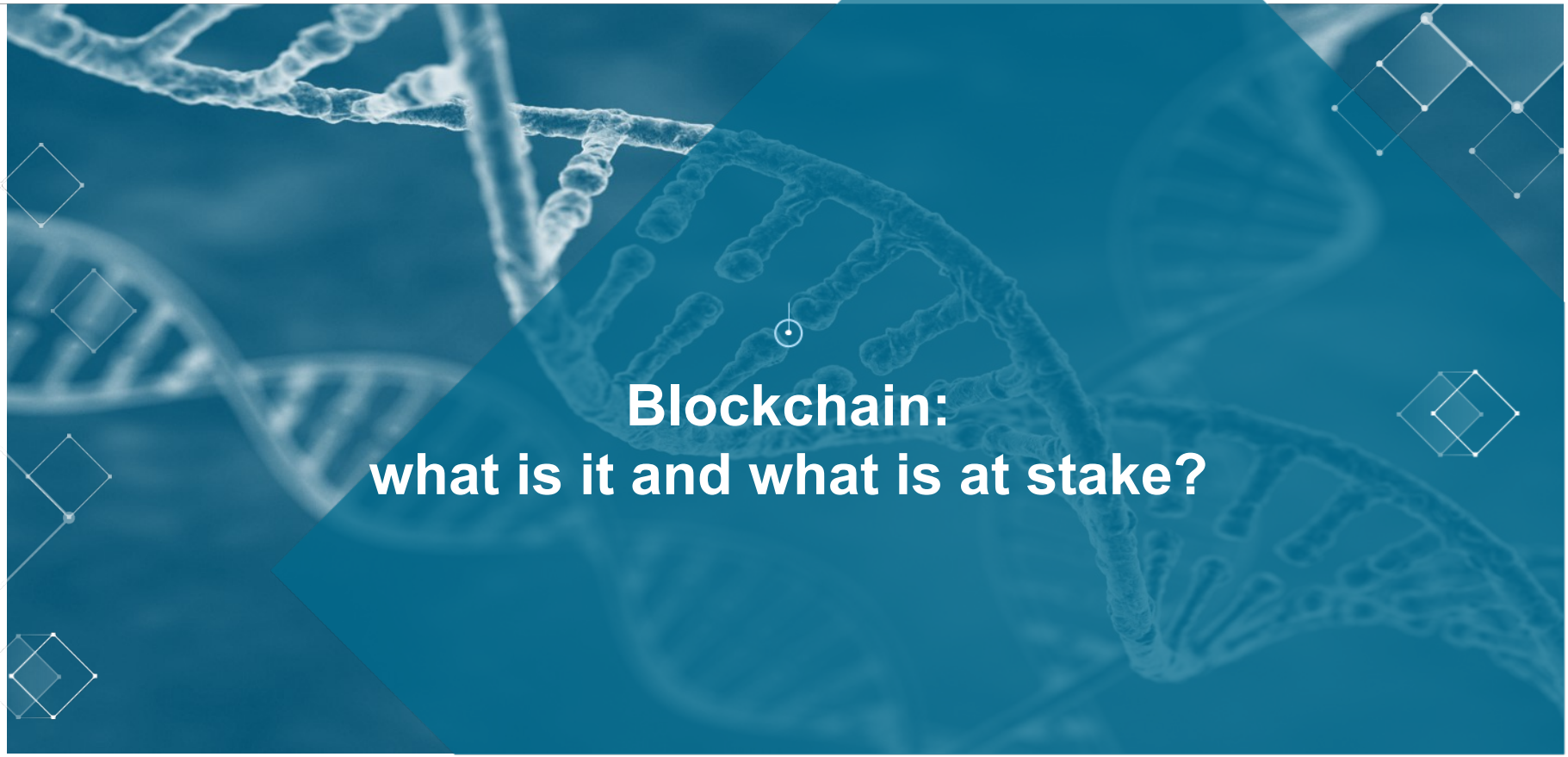
The Art & Science of Risk

Agenda

1. **Blockchain: what is it and what is at stake ?**
2. **Opportunities and challenges for the (re)insurance industry**
3. **SCOR Blockchain “Proof-of-Concept”**
4. **What’s next ?**



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Blockchain: the 2016 buzz?

The Economist, Oct. 2015

La Tribune, Feb. 2016
"Blockchain is a revolution that will change the world"

ARTEMIS, Sept. 2016
"Blockchain is made for reinsurance, a $10 billion opportunity" for PWC

Le Monde, Oct. 2016
Jean-Claude Trichet says:
"Blockchain is a brilliant invention"

Fintechnews.ch, Oct. 2016

The Royal Gazette, Sept. 2016

Google search evolution

Blockchain: natural digital evolution or real disruption?

e-Commerce Economy

Digital supplier of goods and/or services

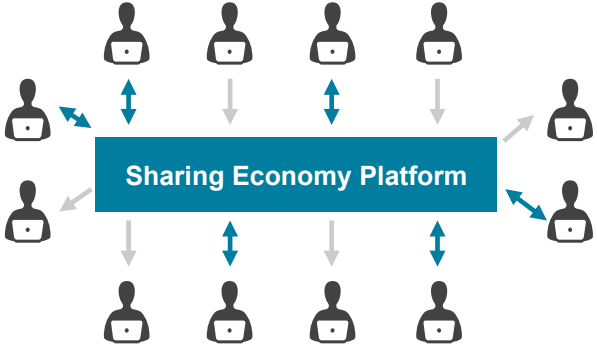
Cdiscount.com

Online BtoC sales platform

Booking.com

Online BtoC accommodation booking platform

Sharing Economy



Intermediation between services providers and customers

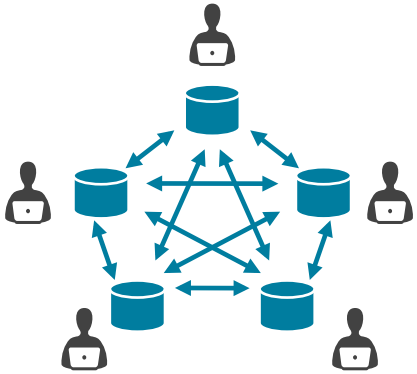
ebay

Online platform providing BtoC and CtoC sales / bidding services

airbnb

Online CtoC accommodation booking platform

Distributed Economy



Direct peer-to-peer relationships

OpenBazaar

Blockchain-based solution to buy and sell goods and services without intermediary

Slock.it

Blockchain-based solution to rent, sell or share accommodations without a third-party

Beyond the hype: major stakes related to Blockchain

Blockchain can become the foundation of a robust system of trust, a decentralized platform of intense collaboration and has the potential to fundamentally change all interactions in the (re)insurance industry

Mutual

Blockchains are shared across organizations, owned equally by all

Distributed

Blockchains are inherently multi-locational data structures and any user has its own copy, thus providing resilience and robustness

Ledger

Blockchains are immutable, once a transaction is written it cannot be erased. This means that the ledgers integrity can easily be proven

Blockchain is a “single version of truth”

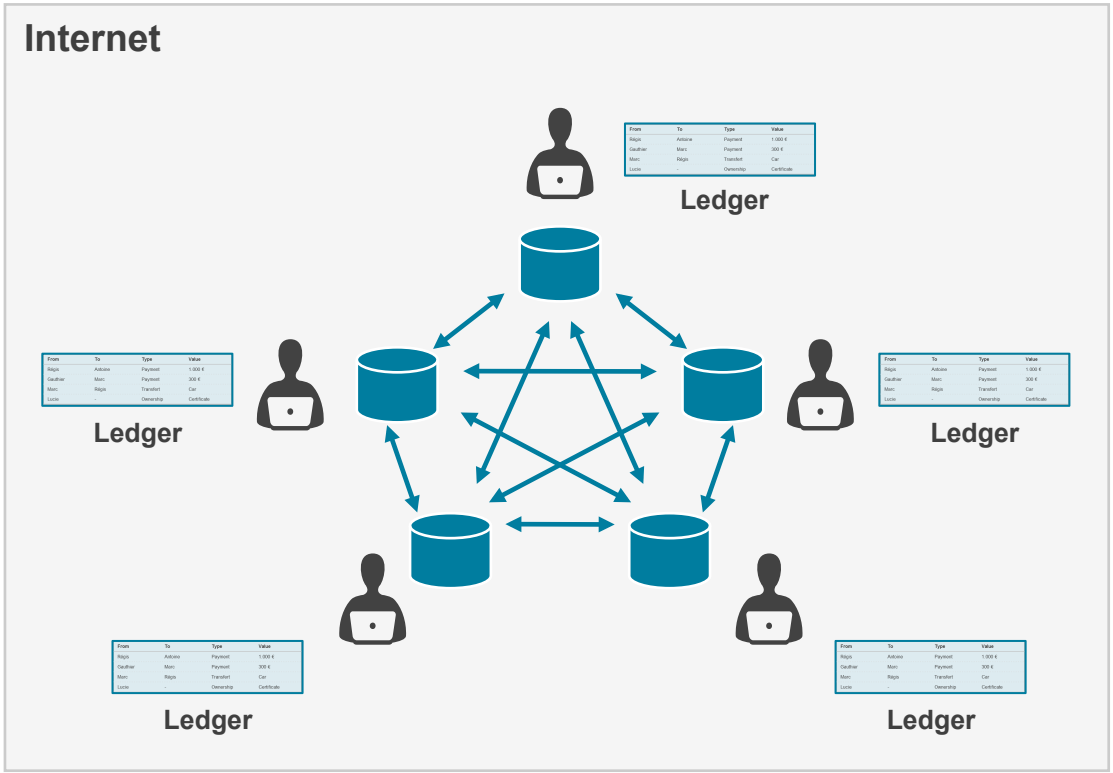
Business users can be confident that transaction data and status are precisely the same as seen by their counterparty
Any changes or updates are automatically propagated to all parties

Reminder of important concepts

“Original” Blockchain or “Mutual Distributed Ledger”

- **The Mutual Distributed Ledger is a ledger replicated on all the nodes (clients) of a peer-to-peer network**

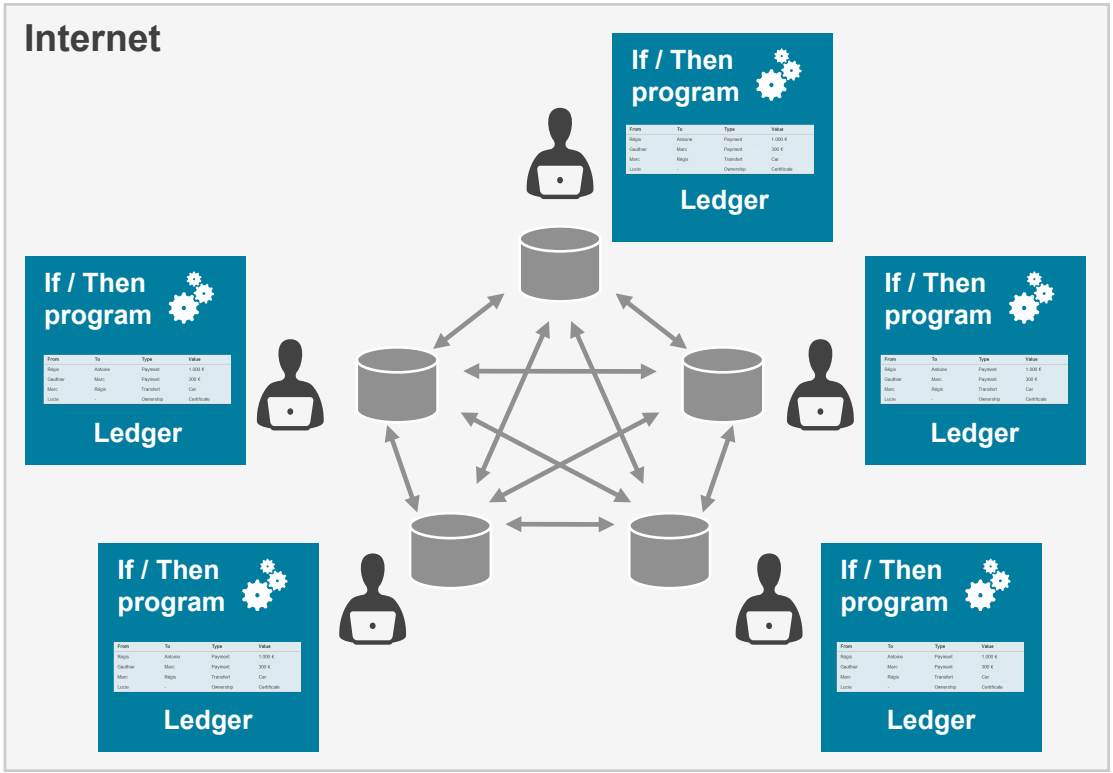
- **Large book**: record events, facts, information or transaction
- **Security:** authentic and unalterable data thanks to advanced cryptographic processes
- **Transparency:** available and shared data since their creation by all the members of the network
- **Resilience:** copy of data are distributed and shared by all the nodes of the network
- **Disintermediation:** autonomous way of working in a P2P mode, without central authority



Reminder of important concepts

“Smart Contract”

- A Smart Contract is a computer program that automatically executes the preset terms of a contract when conditions are met
- Neither smart nor a contract, it is a code element containing conditions triggering actions to execute
- It is an effective way of implementing “straight-through-processing”



- Increase speed / time-to-market
- Better efficiency of business processes
- Certainty that the contract will be executed as agreed

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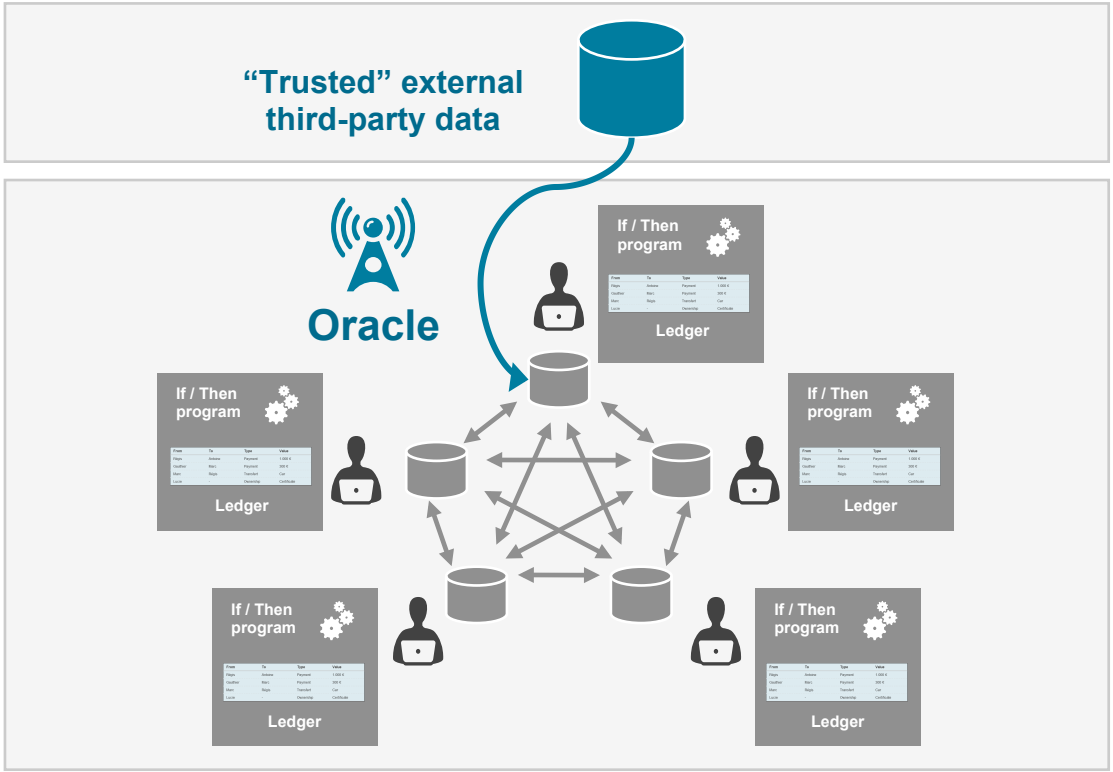
Reminder of important concepts

“Oracles”

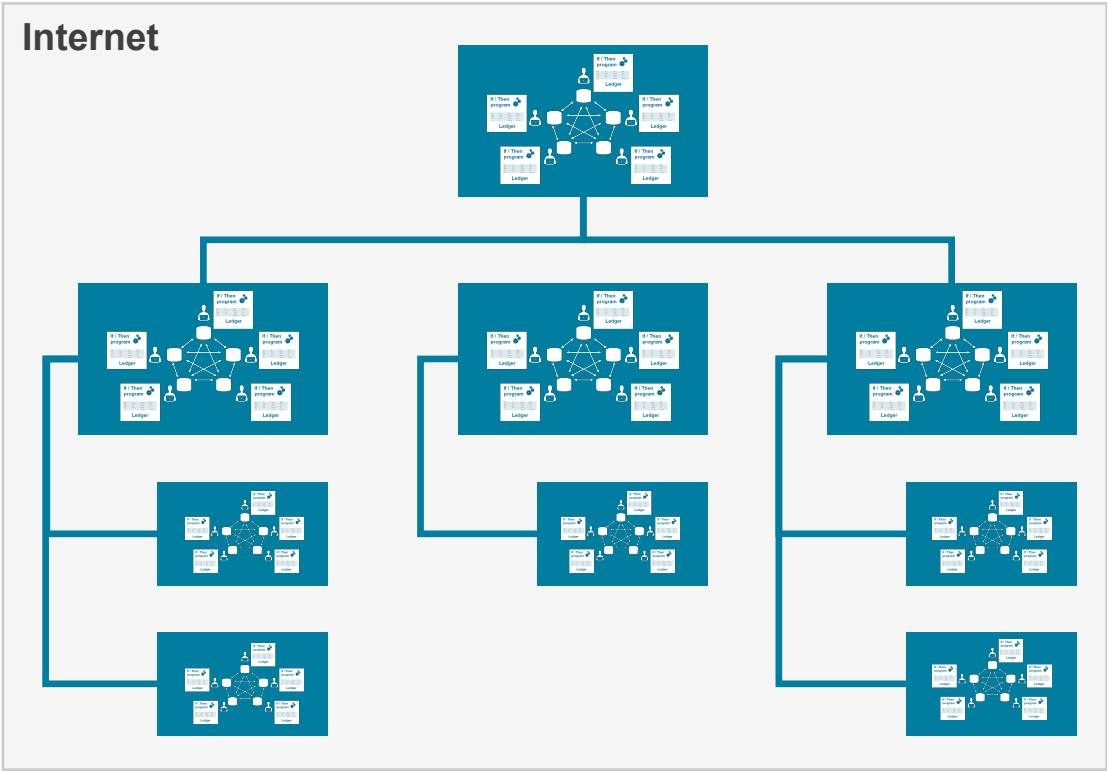
- **Oracles are powerful data services that allow blockchain to communicate with the external ecosystem**
- **Oracles collect external information** (i.e. trusted private/public third-party databases, etc.) **to feed a Smart Contract**
- **The joint implementation of Oracles and Smart Contracts allows autonomous verification of the conditions of a contract**



Reminder of important concepts

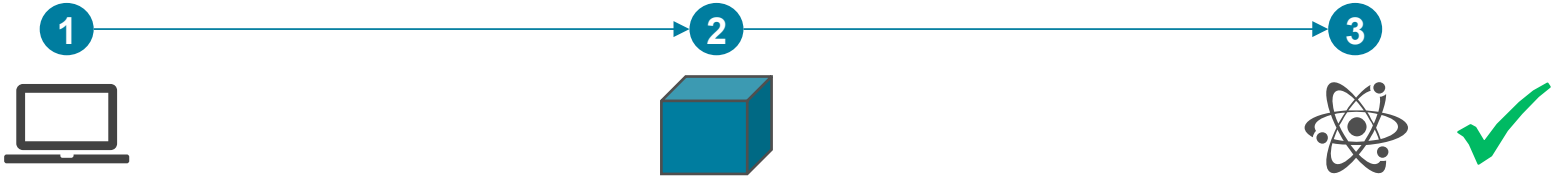
“DAO” or “Decentralized Autonomous Organization”

- **A DAO is an advanced computer program that seals in a blockchain the governance that rules an organization**
- **It can be seen as a matrix that articulates a multitude of smart-contracts**
- **Every decision** (i.e. action, investment, vote, payment) **is achieved in compliance with the rules defined and stored on the blockchain**



Technical background on Blockchain

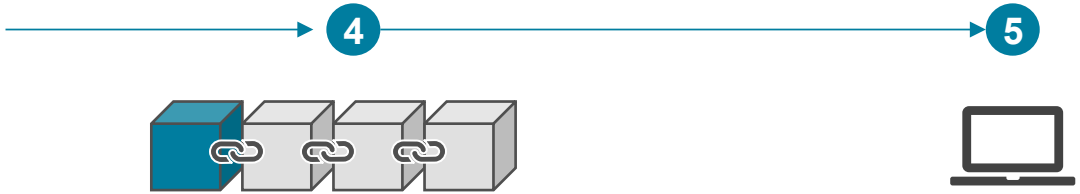
How a transaction does work?



A undertakes **a transaction** towards B

Transactions are **gathered in a block**

The block is validated by the nodes with cryptographic techniques



The block is then added to the chain of blocks (blockchain), to which all the users have access

B **receives A's transaction**

Introduction to the major Blockchain concepts

Why (re)insurers care about blockchain?

Blockchain enables secured peer-to-peer transactions without “trusted central authority”

Peer-to-Peer relationship

The focus shifts from information held by individual entities to information saved in a secured book shared across all verified members of the network

The trust generated by the blockchain process allows to achieve cross-organizational transactions without “trusted central authority”

Transparency

All verified members of a blockchain network can have an access to the whole set of transactions that occurred since the blockchain creation

Since the blockchain is also immutable, this transparency property makes it easily auditable

Security

The transaction validation process is based on cryptographic methods

The decentralized architecture is a security since every transaction needs to be validated by more than half of the blockchain network

Every slightest modification on the blockchain enhances the modification of all the following elements (blocks) of the blockchain, thus making it instantly detectable

Disintermediation

A blockchain implementation can be disruptive by removing the cost of “trusted central authority” recordkeeper intermediary and thus redefining the traditional boarders of organizations and markets

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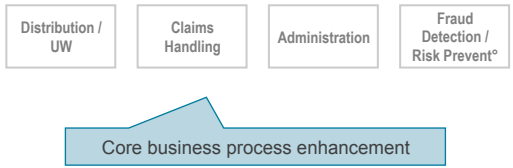
3 major models can be applied for the (re)insurance industry

Internal Processes

Enhance efficiency of core (re)insurance business processes

Increases speed of exchange between business units/divisions, reducing overall operational costs

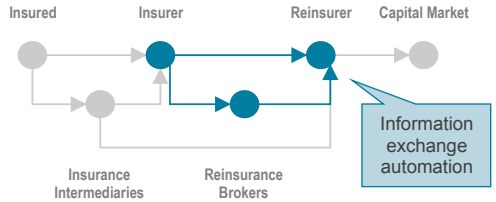
Enables new capabilities to be added to **existing services** and **business processes**



Inter-Organizations

Speed-up market initiative regarding information exchange

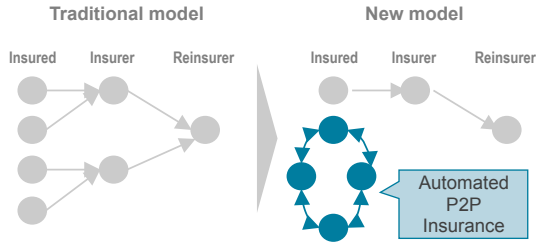
Managing large commercial insurance programs where **different organizations assume separate layers of risks** (incl. Insured-Insurer-Broker-Reinsurer transactions)



Disruption

Create new near-autonomous self-regulated insurance business model

Development of a new disruptive player that leverage **affinity group** or **peer-to-peer social insurance mechanisms** to take advantage of Blockchain Smart Contracts and fund their own coverage pool



Internal Processes I Opportunities & Challenges

Opportunities

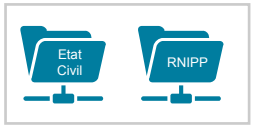
- **Automated contracts**
- **“Usage-based Insurance”** (e.g. telematics, travel, etc.)
- **“Instant-insurance” / Individualized contracts that reflect actual risk**
- **Claims handling optimization**
- **Intra/inter-group cessions**
- **Net settlement**
- **Fraud detection**
- **Auditability improvement**
- **Operating costs reduction**
- **…**

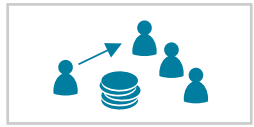
Challenges

- **Blockchain adoption beyond PoC’s**
- **Syndication, ability to engage several market stakeholders to use a distributed Blockchain ledgers approach** (e.g. insurers, intermediaries and a network of service providers)
- **Necessity to have clear and unambiguous contract / claim conditions**
- **Leveraging external data feeding** (e.g. flight delays, satellite images, weather stations, etc.)
- **…**

Internal Processes I Underwriting

Illustration #1 - Life insurance contract lifecycle management





Client side

1. A father underwrites a life-insurance with his insurer, by designating as beneficiaries his wife and two children
3. Names of the insured and beneficiaries are checked on a regular basis with the RNIPP
   In parallel, a verification of the civil status data (weddings, births, divorce, etc.) is also carried out
5. Occurrence of a birth (i.e. potential change in the beneficiaries)
7. The sales rep / tied agent contacts the insure to confirm the change of the beneficiaries
9. Occurrence of death of the insured translates into provision of information at “Etat Civil” level

Blockchain side

2. A Smart Contract is created in a blockchain including the following information: insure name, names of the beneficiaries, amount of the life-insurance
4. Useful data is made available on the Blockchain by an Oracle on a regular basis
   The Smart Contract checks that the “conditions” defined have not been changed
6. The Smart Contract automatically triggers a notification to the sales rep / tied agent who his responsible for the client relationship
8. The Smart Contract is updated with the change of beneficiaries
10. Possibility to automatically issue a compensation order to the beneficiaries

Illustration #2 - Usage-based travel insurance

Client side

1. An individual underwrites a trip insurance contract with an insurer, for travelling abroad in the course of his professional activity
3. In the taxi to the airport, the insured activates his multi-trip insurance through the mobile application of the insurer
4. Thanks to the GPS of its telephone, the insured is geolocated abroad in the coverage area of the insurance
6. The insured is informed of the terms and services associated with its coverage
7. Return to France geolocalisation
   The insured person validates his return and the end of the use of his coverage

Blockchain side

2. Creation of a Smart Contract which includes the relevant information concerning the guarantee "travel abroad"
   Only the relevant guarantee is registered in the Blockchain
4. Insurance is **activated**
   Automatic subscription
8. Insurance is **disabled**
   The amount of the premium to be paid is calculated automatically according to the actual use of the insured (number of days abroad)

Internal Processes I Underwriting

Illustration #3 - Car rental and related car insurance (DocuSign & Visa)

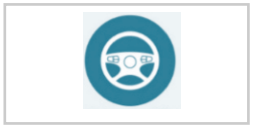
Client side

1 The customer chooses the car he wants to rent after test-driving, evaluating their options, and completing any pre-approvals

3 The customer chooses the lease options for the car – low, mid or high mileage

4 The customer chooses the insurance options - evaluating by coverage, deductible and other factors

6 The customer links his Visa credit card details to pay for the lease and insurance and automatically cover in-car payments (e.g parking…)



7 With the lease and insurance contracts DocuSigned and the Visa credit card integrated, the customer is ready to drive

Blockchain side

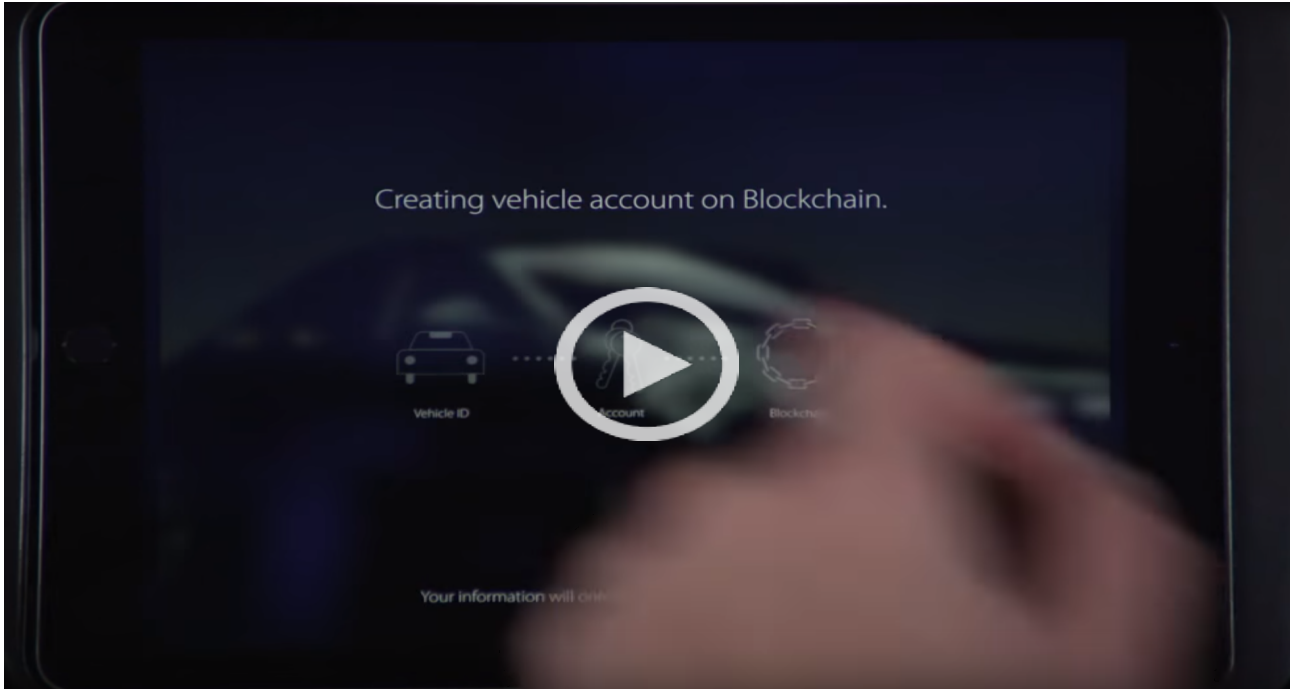
2 The car identity is then registered on Blockchain

5 A corresponding smart contract is created on the Blockchain

8 Once a customer has been driving the car, the system can start to track activities and potentially deliver savings on insurance, or advice about cheaper leasing option

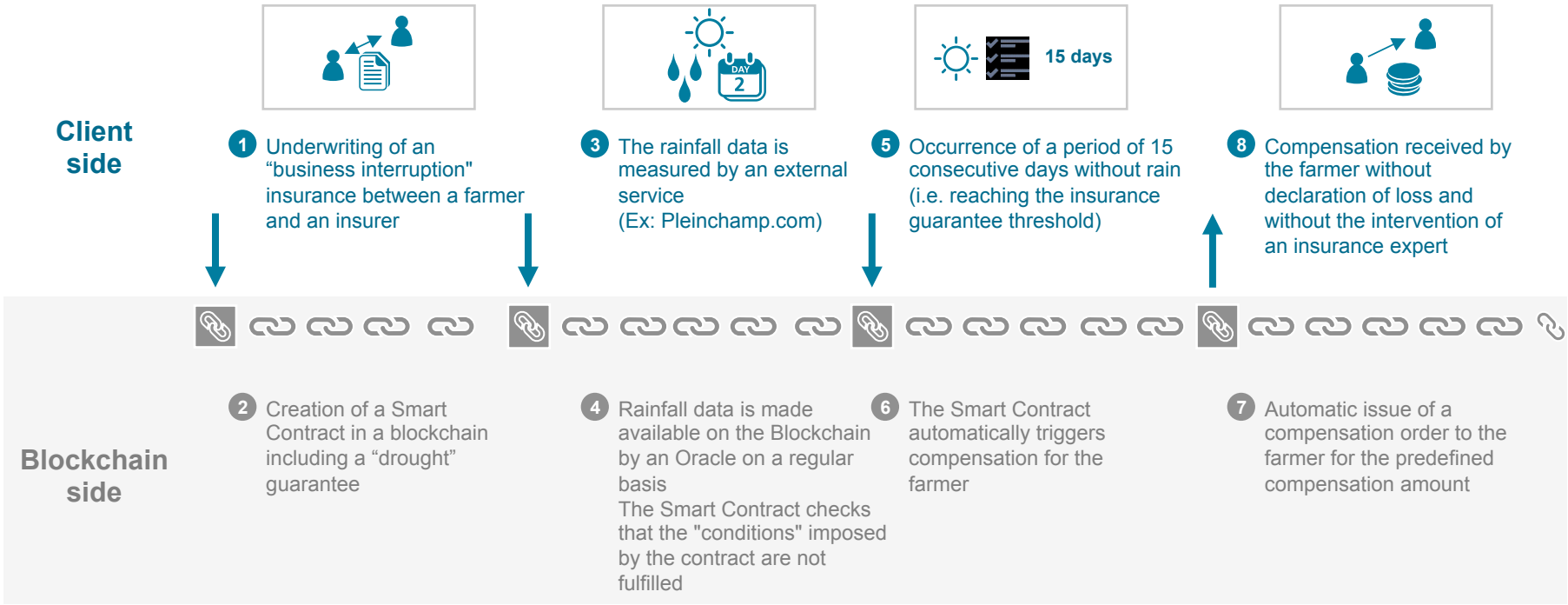
Internal Processes I Underwriting

Illustration #3 - Car rental and related car insurance (DocuSign & Visa)



Internal Processes I Claims Handling

Illustration #1 - Weather index-based farm insurance



Internal Processes I Claims Handling

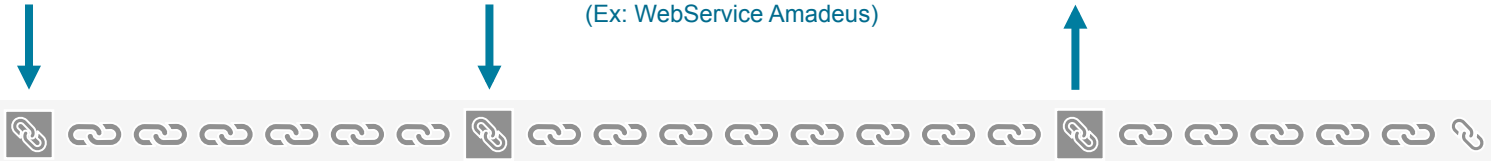
Illustration #2 - Flight insurance delay compensation (InsurETH)

Client side

1. An individual underwrites an automated flight insurance to protect him from flight delay

3. A flight delay occurs, the delay data is measured by an external service (Ex: WebService Amadeus)

6. The subscriber is automatically notified of the payment



Blockchain side

2. A contract with specific policy conditions is built and added in the public ledger of the Blockchain. The individual remains anonymous

4. The event (e.g. flight delay) is notified to the Blockchain Oracle
   The contract gets triggered by the Oracle and the contractual conditions are checked
   If the conditions are validated, the pay out is automatically made to the subscriber

5. The smart contract is updated with the relevant claims handling information

Illustration #1 - Diamond certification (EverLedger)

Client side

1. An individual acquires a diamond
   An official authentication certificate is generated and provided to the buyer
3. After a period of time, the diamond owner declares the theft of his diamond to his insurer
5. Some months later, the diamond reappears on the market on a major market place
   (e.g. professional marketplaces, etc.)
7. The marketplace checks the Blockchain and detects the theft of the diamond some months before

Blockchain side

2. The official diamond certificate (including all diamond specificities) is uploaded within a Blockchain public ledger
4. The event is registered within the Blockchain and the diamond certificate is updated with this information
6. Blockchain allows insurer or potential purchasers to check the history of any individual stone, including previous claims, helping insurers prevent, detect and counter fraud

SCOR Blockchain “Proof-of-Concept”

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Inter-Organizations I Overview of the “Ruschlikon” initiative

Ruschlikon is a large global community of insurers, brokers and reinsurers reshaping the (re)insurance industry through the design and implementation of standard dematerialized exchanges and processes, reducing operational cost and enhancing client service

FROM “Traditional process and its limits”…

- Still largely paper-based, or email attachment
- A significant part of today’s (re)insurance premium is wasted with the unproductive frictional costs of administrative processes between insurers, brokers, reinsurers and retrocessionnaires

… TO “Time and cost saving” with Ruschlikon

- Identify, design and implement industry-wide standard formats, processes and electronic exchanges
- Reduce cost of interactions within the ecosystem
- Improve data granularity and quality for all, using ACORD data standards and Ruschlikon business processes

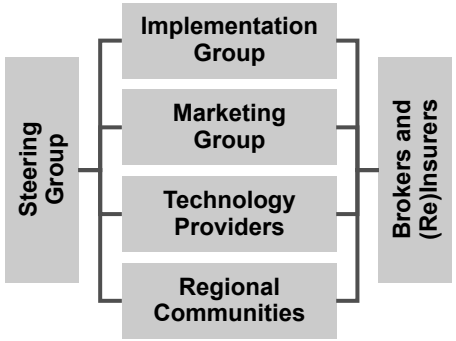
Ruschlikon connects leading players of the (re)insurance industry to advanced back office processes such as technical accounting, claims and settlement

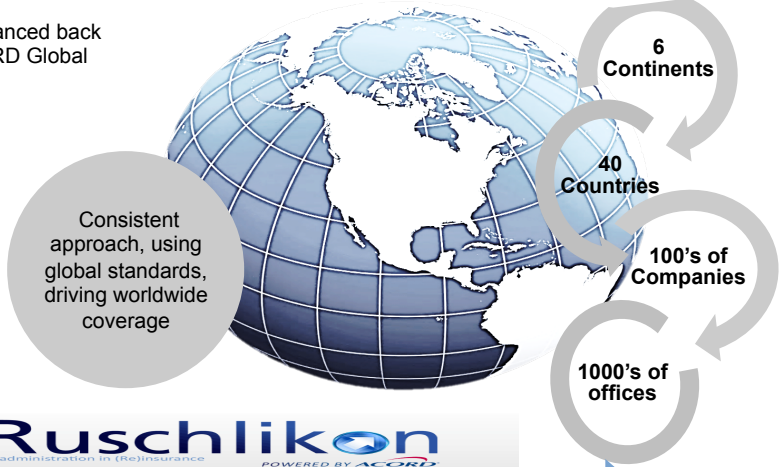
Inter-Organizations I Overview of the “Ruschlikon” initiative

Ruschlikon value proposition

Process Automation | **Less re-work & Queries** | **Enhanced Cashflow** | **Improved Controls** | **Increased Efficiency**

The Ruschlikon Initiative connects leading players of the (re)insurance industry to advanced back office processes including technical accounting, claims and settlement using the ACORD Global Reinsurance and Large Commercial (GRLC) Standards





Ruschlikon
e-administration in (Re)insurance
POWERED BY ACORD

ACORD Standard Data Messages

Placement	Accounting	Settlement
Placing Platform Placement Messages	TA (closing advice) FA (financial statement) CM (claim movement) ACK (message acknowledgement)	PSR Message (settlement files) Reconciliation Messages

Inter-Organizations I Overview of the “Ruschlikon” initiative

Ruschlikon members

Ruschlikon implementations update: 77 partnerships / 46 companies covering commercial insurance, coinsurance and reinsurance across 6 continents / in more than 40 countries

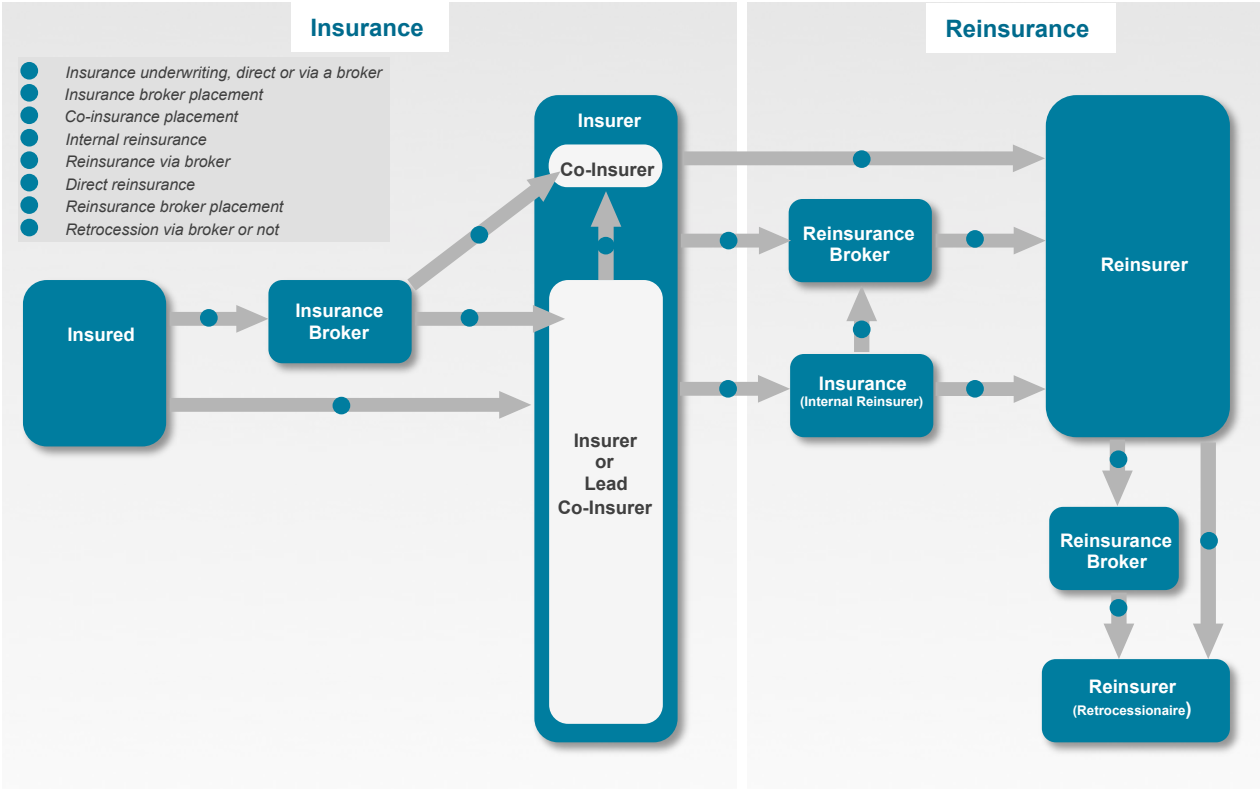
Ruschlikon

Market share

- Ruschlikon reinsurers represent **more than 60% of the global reinsurance market**
- The 3 leading brokers are Ruschlikon members, and represent **75% of the reinsurance broker market**
- The Ruschlikon carriers cover **around 50% of the P&C business written in the London Market**

Inter-Organizations I Overview of the “Ruschlikon” initiative

Ruschlikon e-workflow



Inter-Organizations I Overview of the “Ruschlikon” initiative

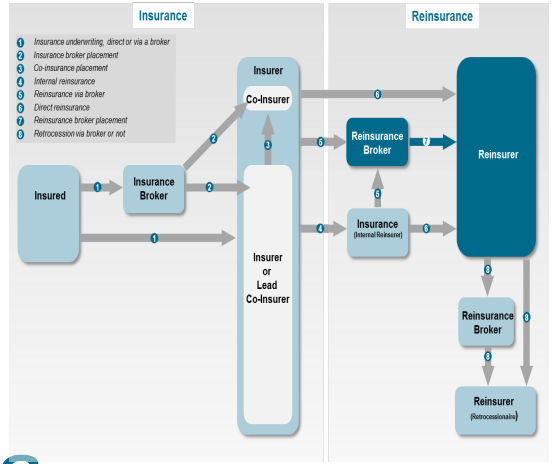
Demonstration video: “The (re)insurance end-to-end process in the digital world”

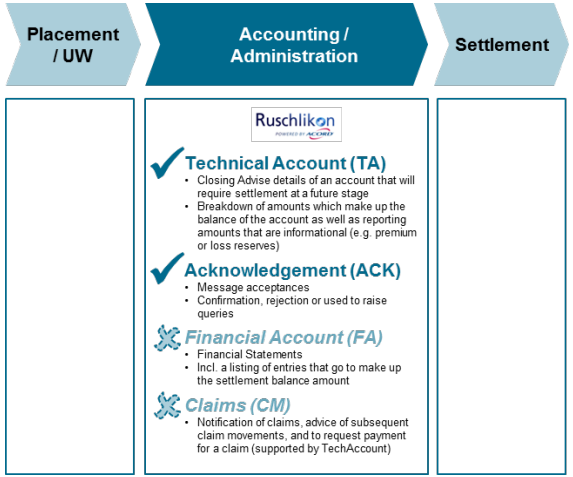
Inter-Organizations I SCOR Blockchain “Proof-of-Concept”

Business scope of the SCOR Blockchain PoC (on behalf of Ruschlikon)

SCOR has performed a 2-month “Proof-of-Concept” to assess the feasibility of using blockchain technology (permissioned Ethereum) to enhance the Ruschlikon initiative

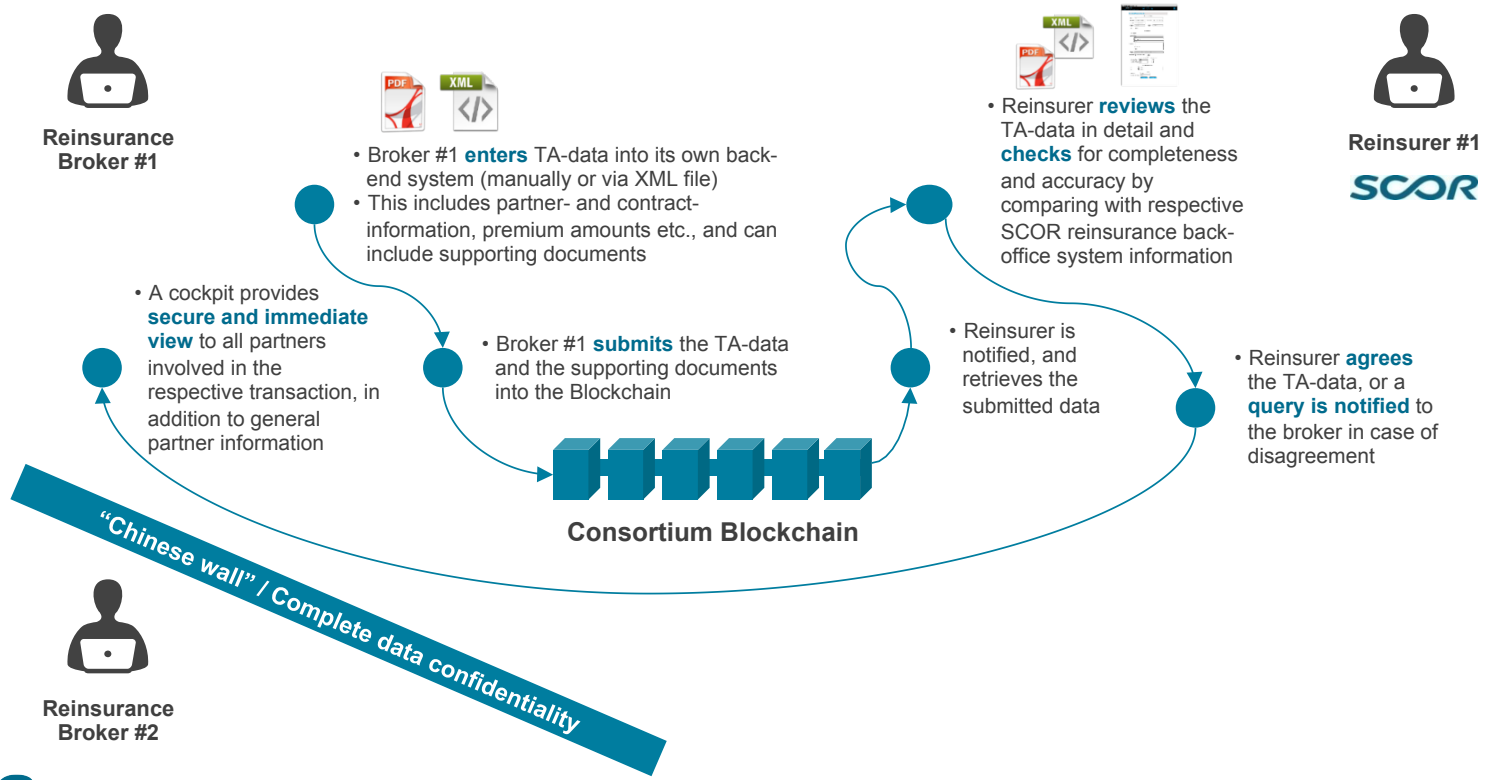
A simulation of representative core transactional data exchange (ACORD “Technical Account” and “Acknowledgement” messages) between 2 Reinsurance Brokers and 1 Reinsurer has been successfully implemented





Inter-Organizations I SCOR Blockchain “Proof-of-Concept”

Key stages of the end-to-end business process

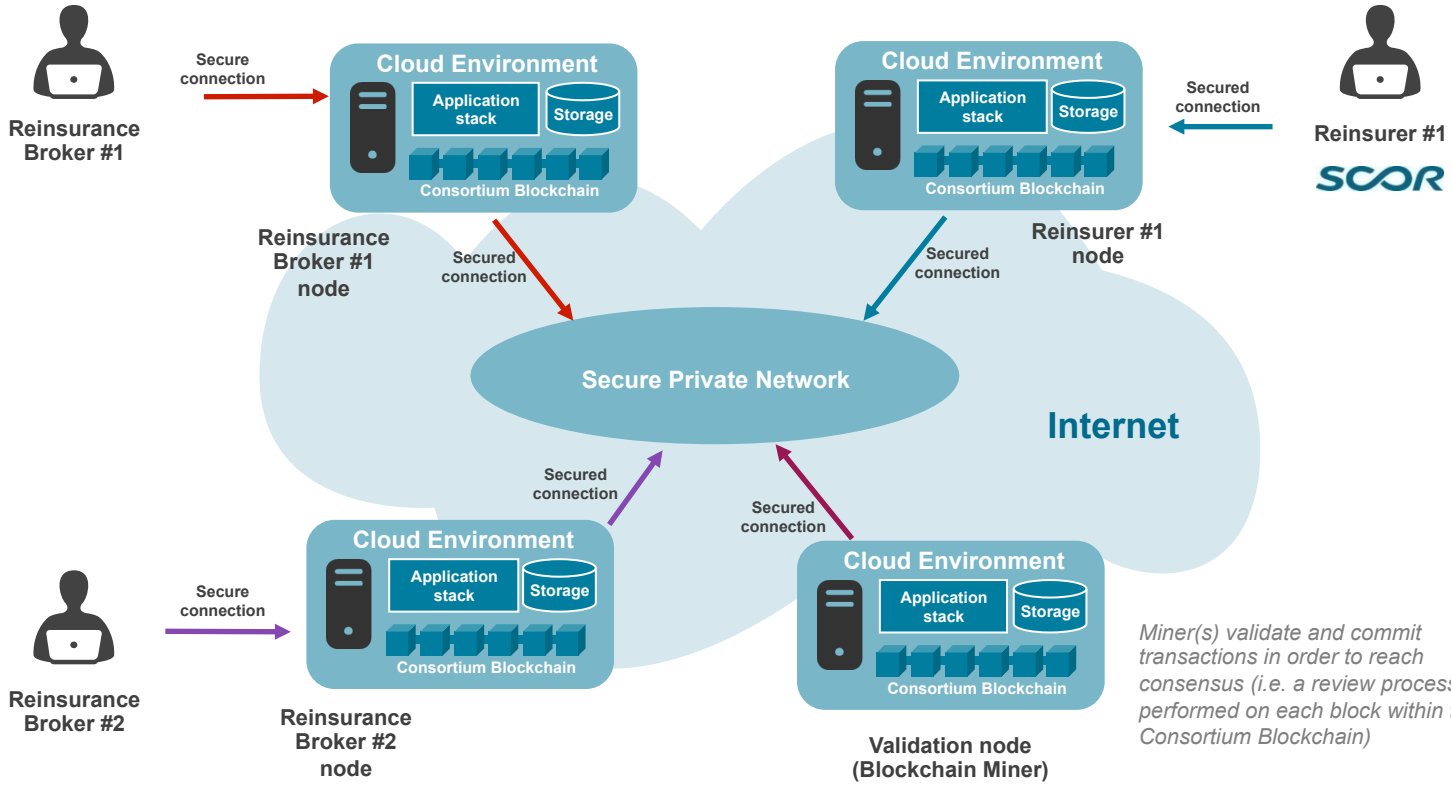


Inter-Organizations I SCOR Blockchain “Proof-of-Concept”

Demonstration of the solution

Inter-Organizations I SCOR Blockchain "Proof-of-Concept"

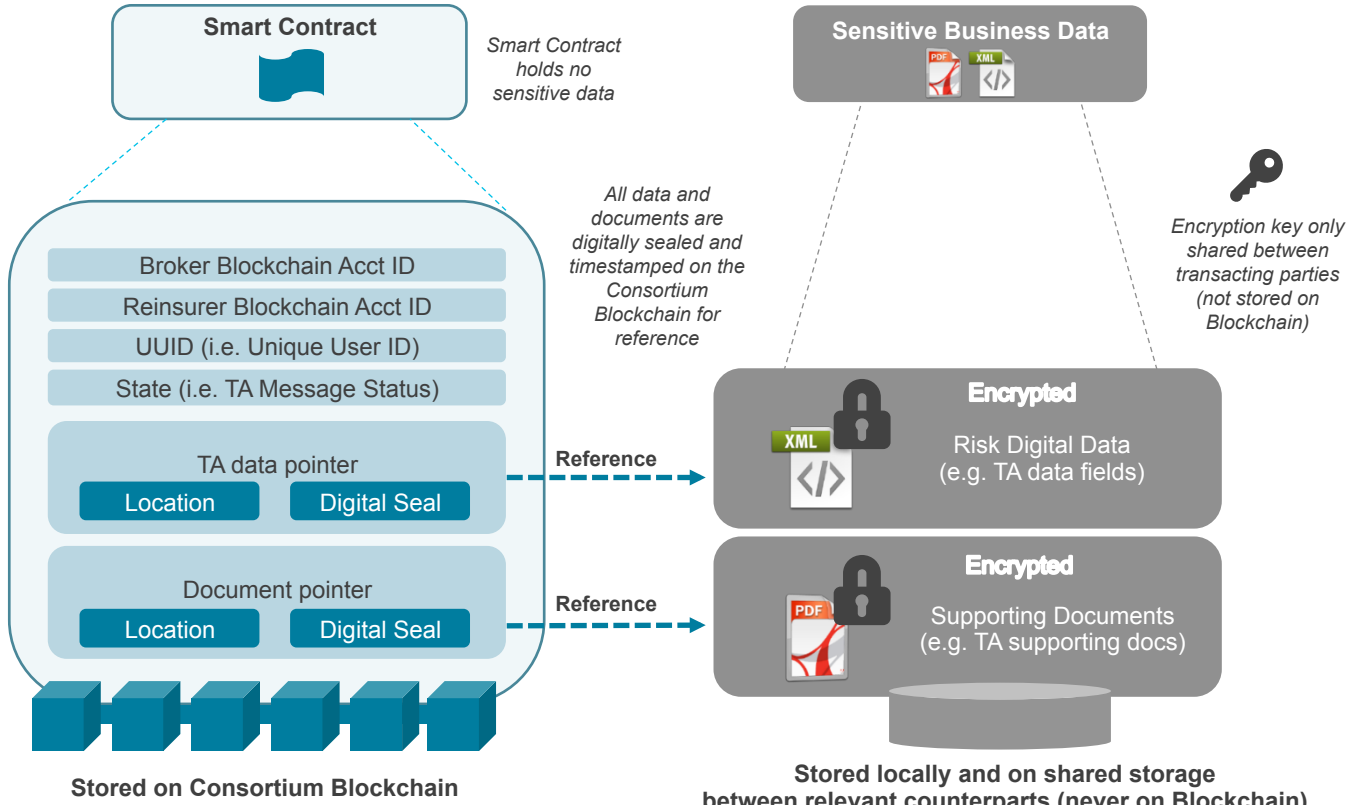
Overview of supporting technologies



Miner(s) validate and commit transactions in order to reach consensus (i.e. a review process performed on each block within the Consortium Blockchain)

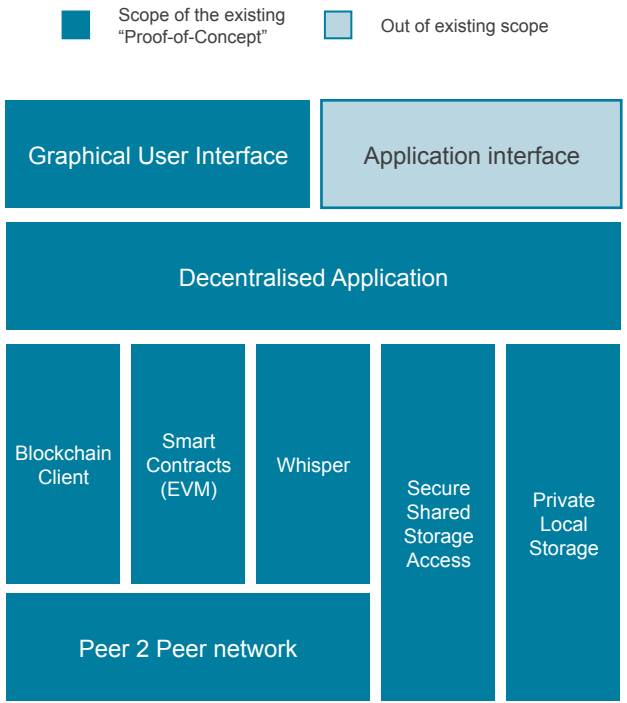
Inter-Organizations I SCOR Blockchain “Proof-of-Concept”

Data privacy and segregation



Detailed view of the SCOR's TA Blockchain "Proof-of-Concept" solution

Node components

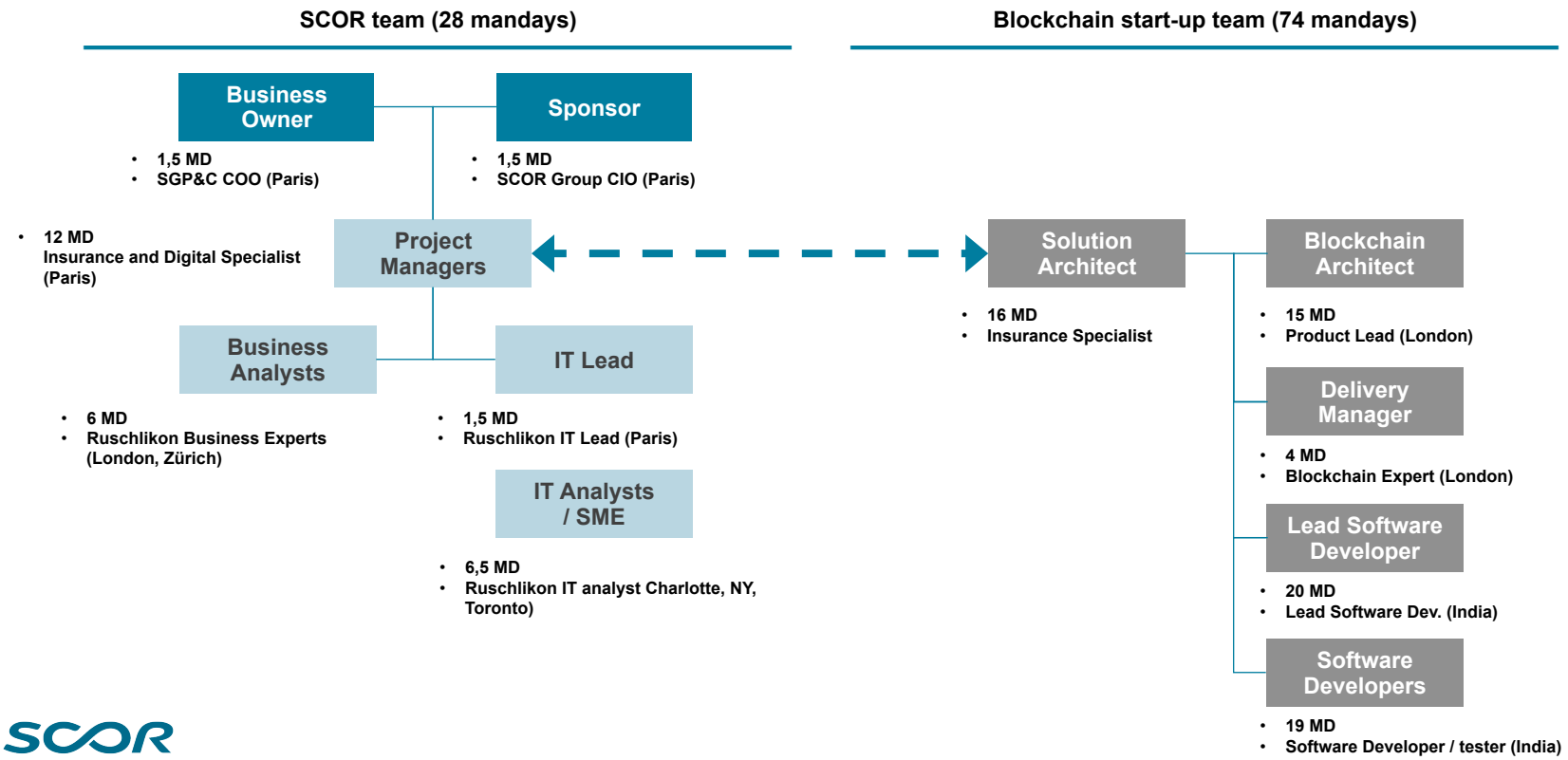


- **Peer 2 Peer network** – Provides the connectivity between nodes (Ethereum DEVP2P)
- **Blockchain Client** – Transaction submission, transaction storage, Blockchain accounts and chain interface (Ethereum)
- **Smart Contracts** – Written in solidity then complied for EVM, accessed through Blockchain client (Ethereum)
- **Whisper** – Dark, secure and guaranteed transient notification routing (Ethereum)
- **Secure Shared Storage Access** – Stores encrypted data which is referenced in smart contracts, also Consortium (AWS S3)
- **Private Local Storage** – Stores local copy of encrypted data for guaranteed access. Holds symmetric encryption keys and Blockchain account keys (MongoDB + File system)
- **Decentralised Application** – JavaScript based application with added access control for underlying components. Acts as the glue between all components (Meteor Server)
- **Graphical User Interface** – Web based end user interface to TA PoC application (Meteor Client)

Source: SCOR TA Blockchain POC Working Group – Oct. 2016

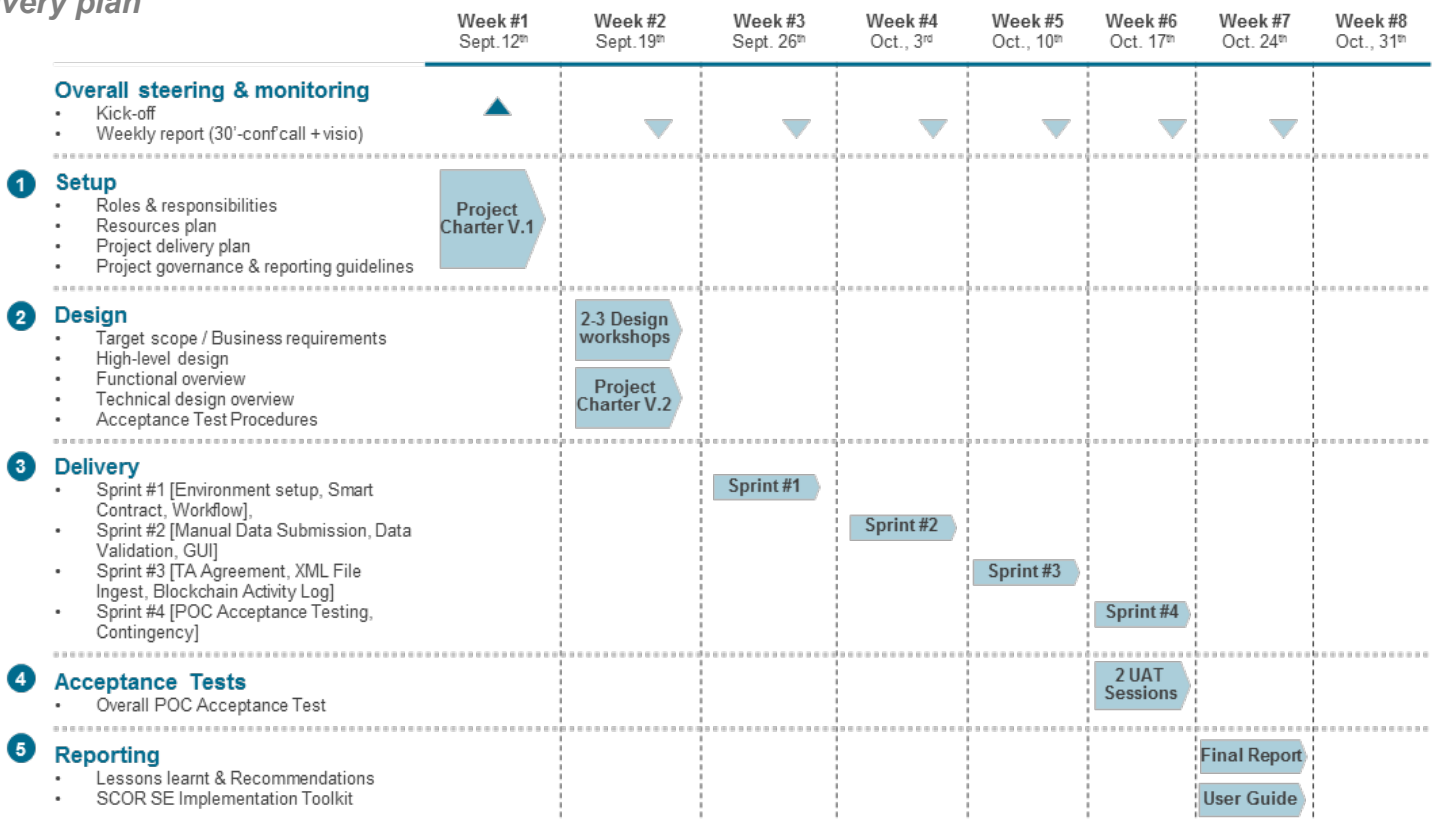
Inter-Organizations I SCOR Blockchain “Proof-of-Concept”

Team and Organization



Inter-Organizations I SCOR Blockchain “Proof-of-Concept”

8-weeks delivery plan



SCOR
The Art & Science of Risk

Inter-Organizations I SCOR Blockchain “Proof-of-Concept”

Major outcomes

The PoC proved that blockchain could successfully deliver this trading capability, it also showed that there are wider opportunities and future considerations

Positive Results

Agile and quick development over a 2-month period
- Confirming technical feasibility and efficiency potential
- Close to real-time message-hub
- Robust, secure, encrypted, permission driven environment
- Immutable, traceable, auditable

Forces unique, simplified way of interaction
- Single version of truth
- No message resubmission and no duplicate messages
- Relevant supporting documents securely shared

Efficiency gains and cost reductions
- Onboarding costs: Easiest way to integrate new partners
- Running costs: unique, simplified way of interaction, cheap infrastructure costs and simplified “release management” between counter-parts

To be checked

Scalability, performance, privacy
- Behaviour in multi-company, high-volume, complex business environment not yet experienced

Shift to community
- Scope, active participants, target-operator, technical environment, multiplicity of the Blockchain communities

Coexistence with existing world, building the “new”
- Necessity to maintain “old” and “new” world in parallel
- Further study integration with our systems
- Need to partially re-architecture/rebuild e-processing/Omega back-end environment

Total cost perspective
- Apparently inexpensive technical setup – but total cost of developing and running a fully integrated Blockchain still to be explored


What’s next ?

The (re)insurance ecosystem has already begun to address the topic

Market initiatives

- Dec. 2015 – **Blockchain innovation lab** with AXA Group, BNP Paribas, BPCE Group, CNAM, CNP Assurances, Crédit Agricole Group, Croissance Plus, French Finance competitiveness pole and several Blockchain start-ups

- March 2016 - In the frame of the new TOM, **opportunity study on how Blockchain technology can automate exchanges** between Ceding companies / B2B Brokers and Reinsurers

- May 2016 – Launch of **Blockchain Bermuda non-profit cross-industry think tank** Focus on **Insurance Linked Securities (ILS)** market to trade more liquidly and expand beyond the P&C sector

- Oct. 2016 – Launch of **B3I "Blockchain Insurance Industry Initiative"**

- Oct. 2016 – Launch of the **InsurTech Academy**, a collaborative research consortium for insurers to explore areas of common interest in Blockchain

- Oct. 2016 – Launch of the **FFA Insurance Blockchain consortium** in the frame of the Digital Commission

Jan. 2016 → **Today**

Individual (re)insurers initiatives

- Jan. 2016 – **Several Proof-of-Concepts** performed at Group level on Blockchain **on core insurance processes**

- March 2016 – **Blockchain Proof-of-Concept** launched at Allianz France level on **intra-organization business processes**

- May 2016 – Blockchain PoC for **intra-group retrocession process**

- May 2016 – Chinese bankinsurer that **joins R3 CEV Blockchain consortium**

- June 2016 – Blockchain PoC at Group level dedicated to **Cat Bond management**

- June 2016 –Member of the **R3 CEV Blockchain consortium**

- August 2016 – Member of the **R3 CEV Blockchain consortium**

- Sept 2016 – Launch of a **Technical Accounting Blockchain PoC** based on Ruschlikon TA / ACK ACORD message exchange

B3I, one truly significant (re)insurance market initiative

Launched in October 2016, B3I (i.e. "Blockchain Insurance Industry Initiative") is aiming to explore the potential of blockchain to better serve clients through faster, more efficient and secured services

Munich RE

Swiss Re

Allianz

ZURICH

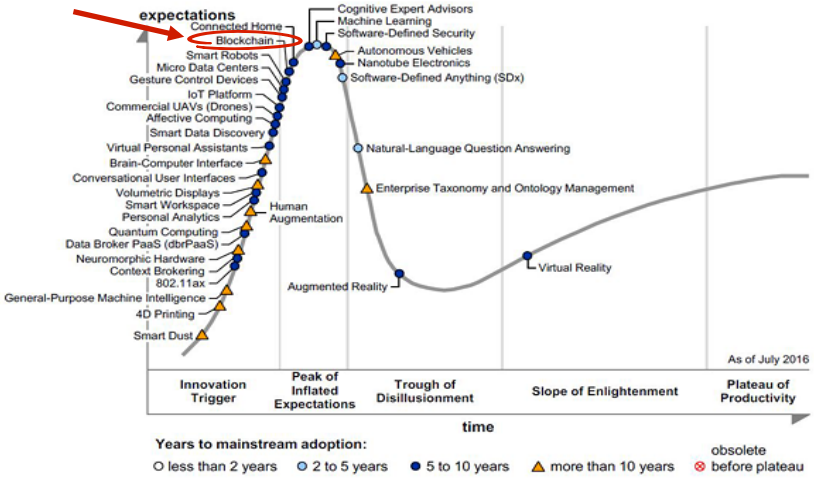
AEGON

…+ new joiners

The 5 founders of B3I (Aegon, Allianz, Munich Re, Swiss Re and Zurich) and new members are actively working on inter-group retrocession in order to move forward on this topic and assess how Blockchain technology can be established as a viable tool for the (re)insurance industry

… nevertheless, it remains a nascent technology

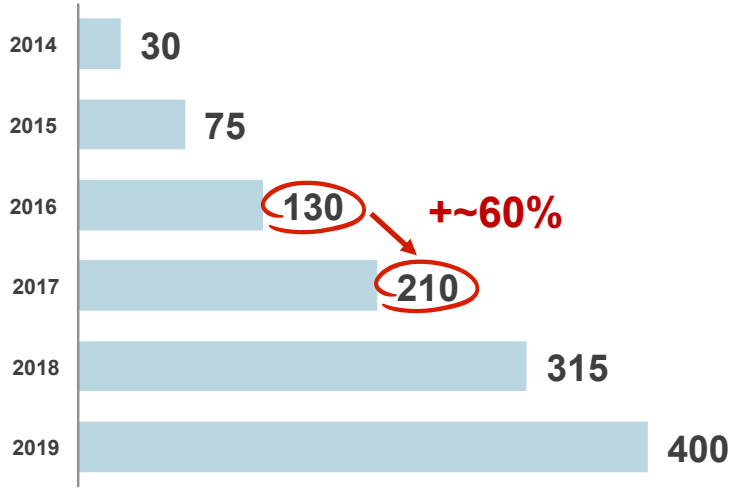
Gartner's 2016 hype cycle for emerging technologies



Source: Gartner, July 2016

A technology which is at the top of the "hype" phenomena with a mainstream adoption estimated at 5-10 years

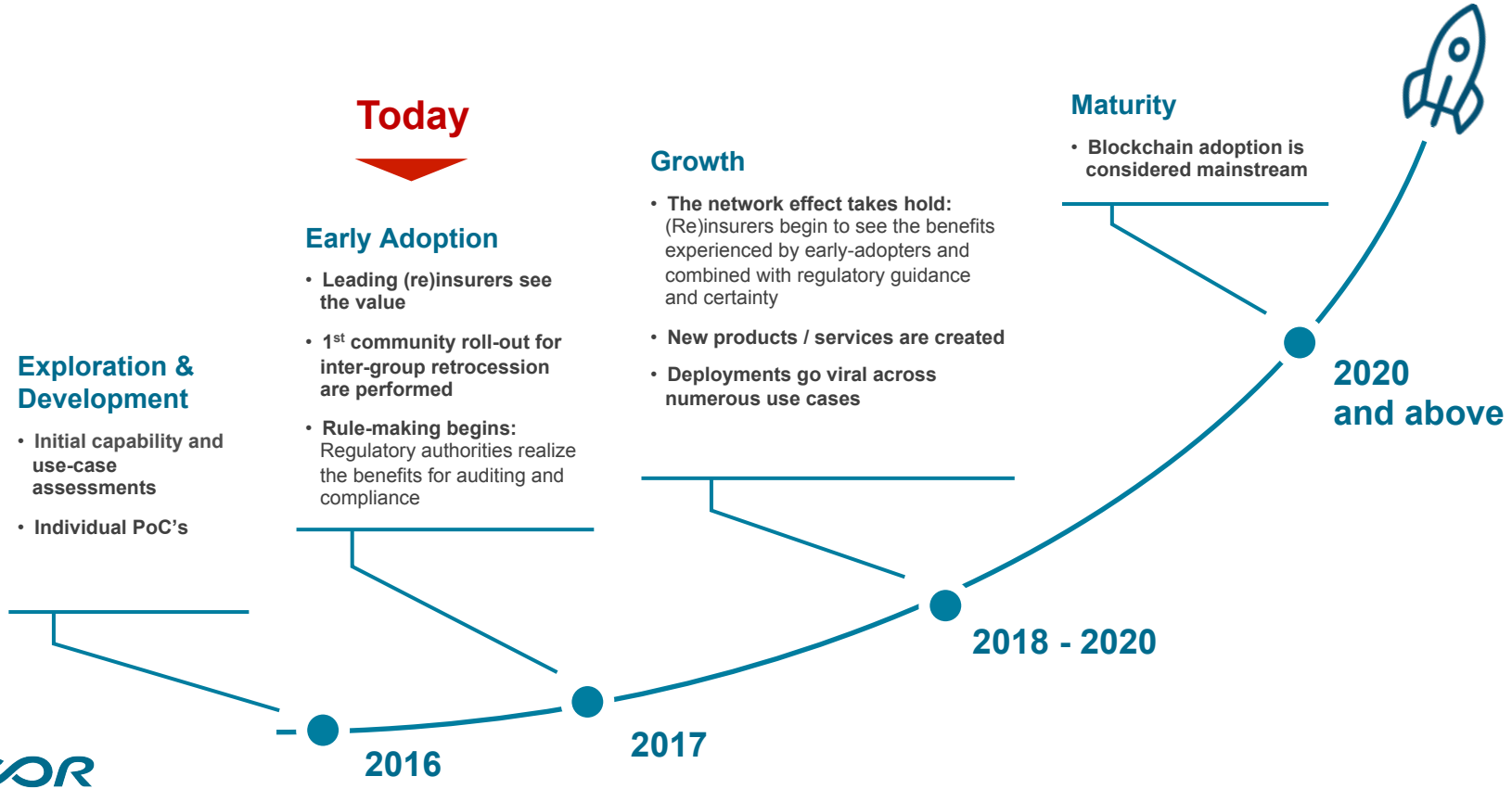
Estimated capital investments spending on Blockchain technology ($M)



Source: Alte Group, December 2016

A strong increase of investment planned for 2017

What Blockchain adoption could look like?



Combination of IoT, Blockchain and AI could enable sustainable development at scale

Maxim Orlovsky: "l'avenir appartient à ceux qui sauront faire converger les technologies de l'intelligence artificielle et le système de la blockchain".

Neuroscientist, cognitive architectures specialist with experience in neural networking, machine learning, pattern recognition, data science and compexity science. PhD, MD.

While IoT and AI will enable the 'animation of the physical world Blockchain's smart contracts on the immutable distributed ledger will allow real economy assets, infrastructures and processes to interact with the financial system in predictable ways and with business models that were unheard of ten years ago.

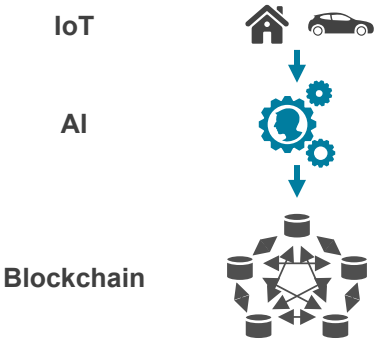
"Providing this two-way real-time interoperability between the real economy and the financial system will be disruptive"

Source: http://www.econotimes.com/Combination-of-IoT-blockchain-and-AI-would-enable-sustainable-development-agenda-at-scale-UNEP-469385

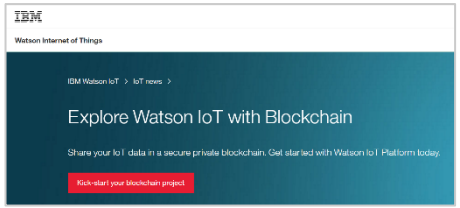
A preliminary vision of the potentialities: mixing Blockchain and AI

[Short-term – 3 years]

Combination of IoT, Blockchain and AI

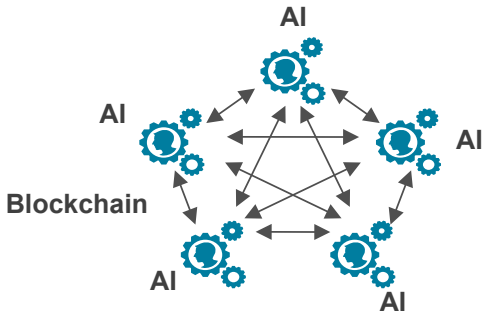


Providing this two-way real-time interoperability between the real economy and the financial system will be disruptive



[Mid-term – 10 to 15 years]

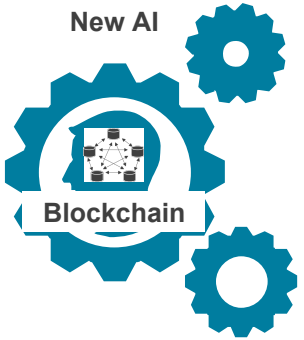
Blockchain, a guarantee to control AI



The Blockchain consensus might be a way to keep potential malicious AIs under control

[Long-term – 30 years]

Blockchain, a new architecture for a new AI



The Blockchain technology might open the way to a new type of AI by getting closer to the real neuronal behaviour

From « Proof-of-Work » to « Proof-of-Recognition »

BICA Labs

Key ideas to remember

Blockchain can become the foundation of a robust system of trust and has the potential to fundamentally change all interactions in the (re)insurance industry

Structuration and early tests have significantly progress over the last months

1st concrete Blockchain applications will be rolled-out in production by end of 2017

Significant benefits will only emerge if the whole (re)insurance community adheres to marketplace blockchain initiative(s), but…adoption promises to be quick