

# Blockchain



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## **Section 1 : Blockchain Introduction**

- What is Blockchain?
- Blockchain Advantages
- Types of Blockchain networks
- How does Block Chain work
- Technology evolution and adoption

## **Section 2 : Blockchain Market and Use cases**

- Market and Industry Evolution
- Key Use cases and case studies in :
  - Banking and Financial Services
  - Healthcare
  - Public Sector
  - Retail and Manufacturing
  - Social Impact

## **Q&A**

What is a Blockchain?



Originally developed for international payments.

A Blockchain is a secure, digital, distributed ledger that uses public/private signature technology to validate and record transactions in near real-time.

# Blockchain | 4 Pillars

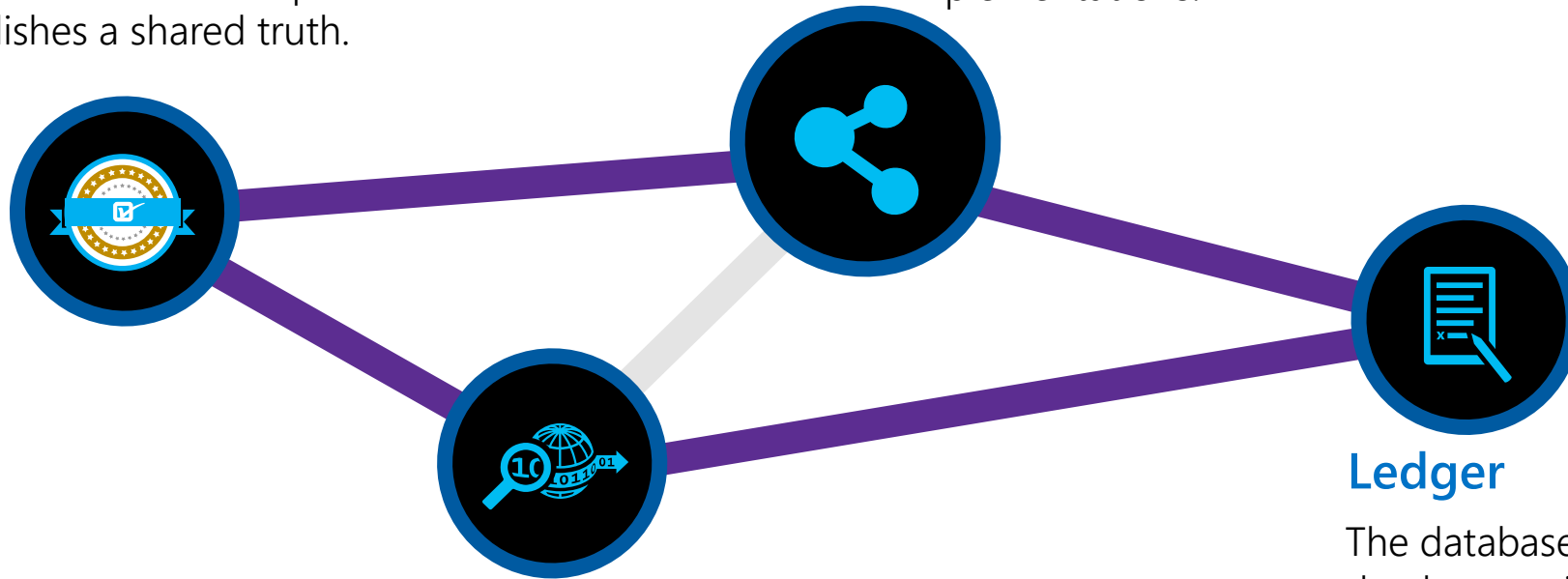
A cryptographically secure, shared, distributed ledger

## Secure

Uses tried and true public/ private signature technology. Blockchain applies this technology to create transactions that are impervious to fraud and establishes a shared truth.

## Shared

Blockchain's value is directly linked to the number of organizations or companies that participate in them. There is huge value for even the fiercest of competitors to participate with each other in these shared database implementations.



## Distributed

There are many replicas of the Blockchain database. In fact, the more replicas there are, the more authentic it becomes.

## Ledger

The database is a read/write-once database so it is an immutable record of every transaction that occurs.

# Blockchain | Multiple Chain Types

## Blockchains

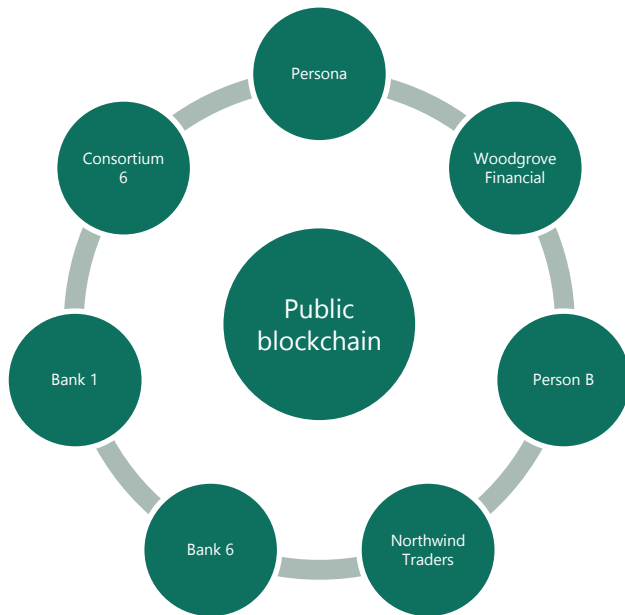


## Alternative blockchains (*altchains*)



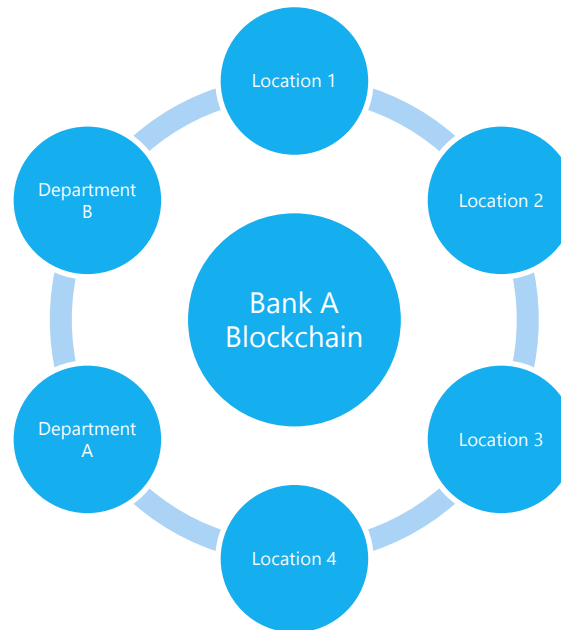
# Blockchain | Network Types

## Public



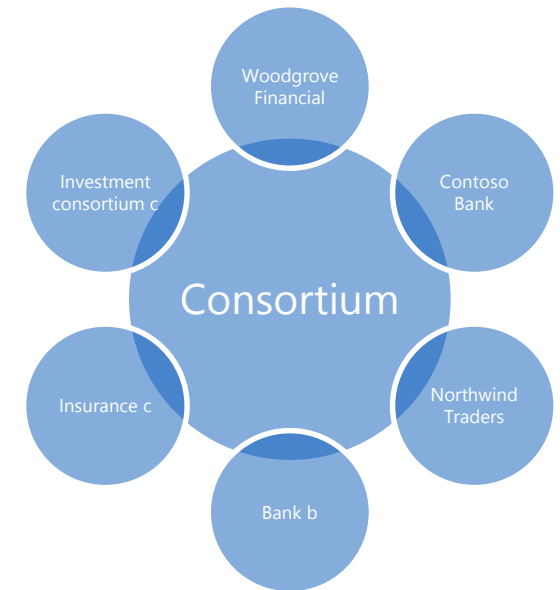
- Many, unknown participants
- Writes by all participants
- Reads by all participants
- Consensus by Proof of Work

## Private



- Known participants from one organization
- Write permissions centralized
- Reads may be public or restricted
- Multiple algorithms for consensus

## Consortium



- Known participants from multiple organizations
- Writes require consensus of several participants
- Reads may be public or restricted
- Multiple algorithms for consensus

How does it work?

1 Company A **wants to transfer a value** to Company B (i.e. digital currently, a digital asset, a certificate, etc.).



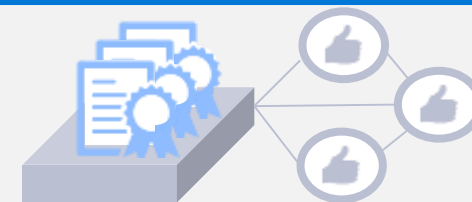
2 Company A uses a digital app to transfer the value to Company B. The app **stamps the transaction with Company A digital signature**, and now needs to be verified by blockchain.



3 Company A **transaction is stored in the ledger as a block** with other transaction. The block has an unique ID, the transition time **and the ID of the previous block in the chain**.



4 The block containing Company A transaction is then **broadcast to the entire network to be verified in each node**.



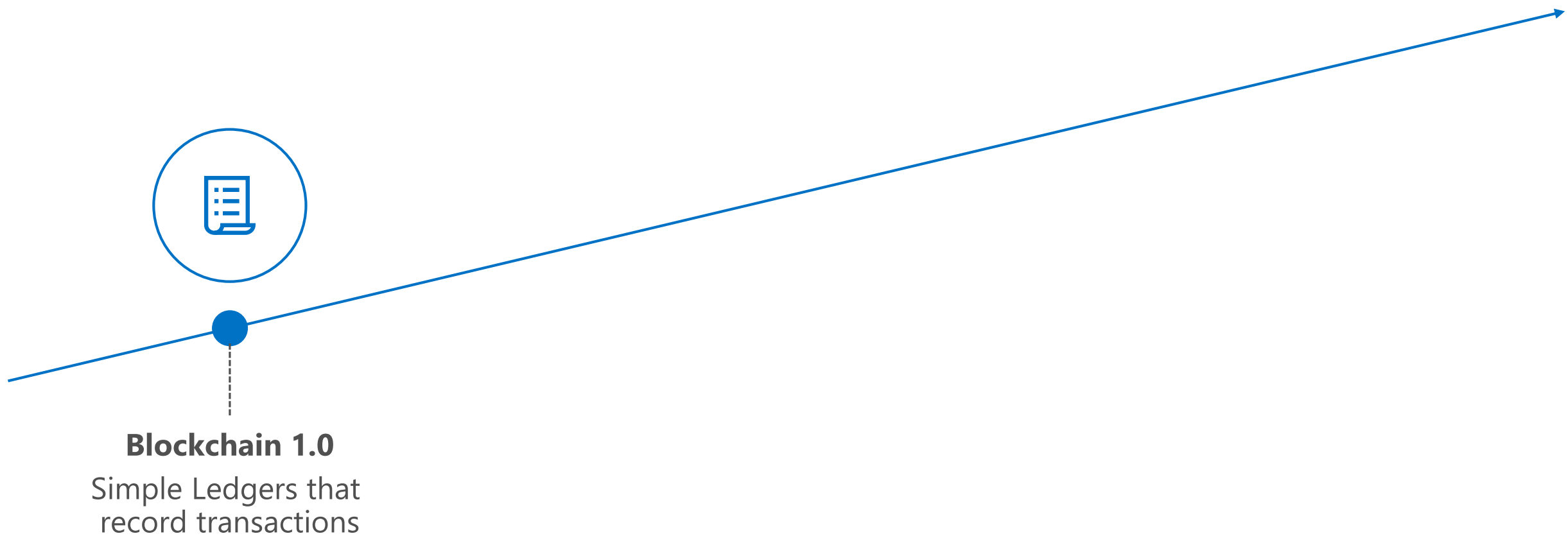
5 After the verification process, Company B **receives the value**, and all the transaction history remains permanent and transparent available for all the blockchain participants.





# Evolution of Blockchain

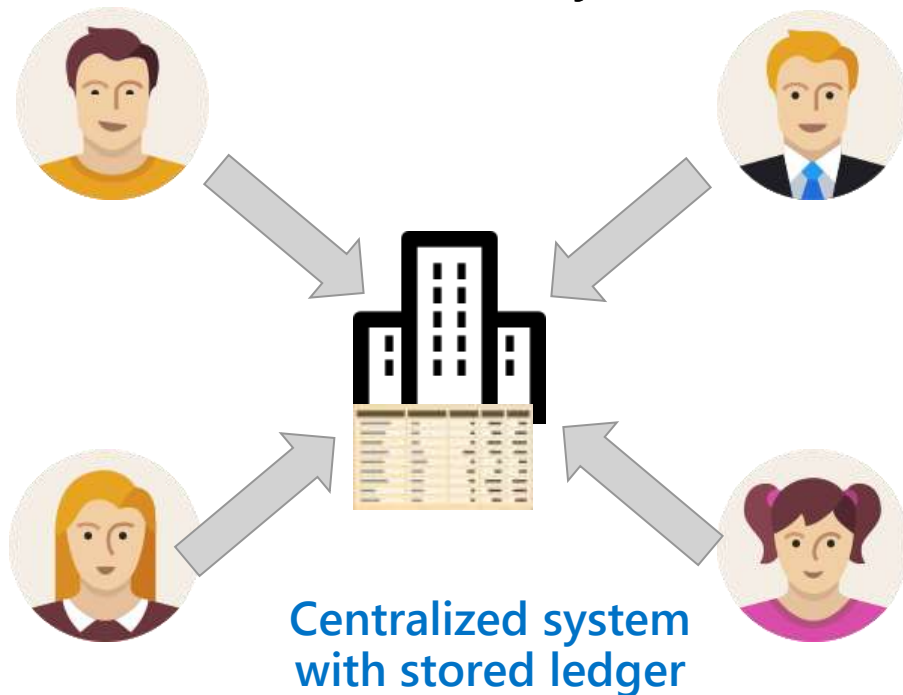
*Blockchain 1.0 – A simple ledger*



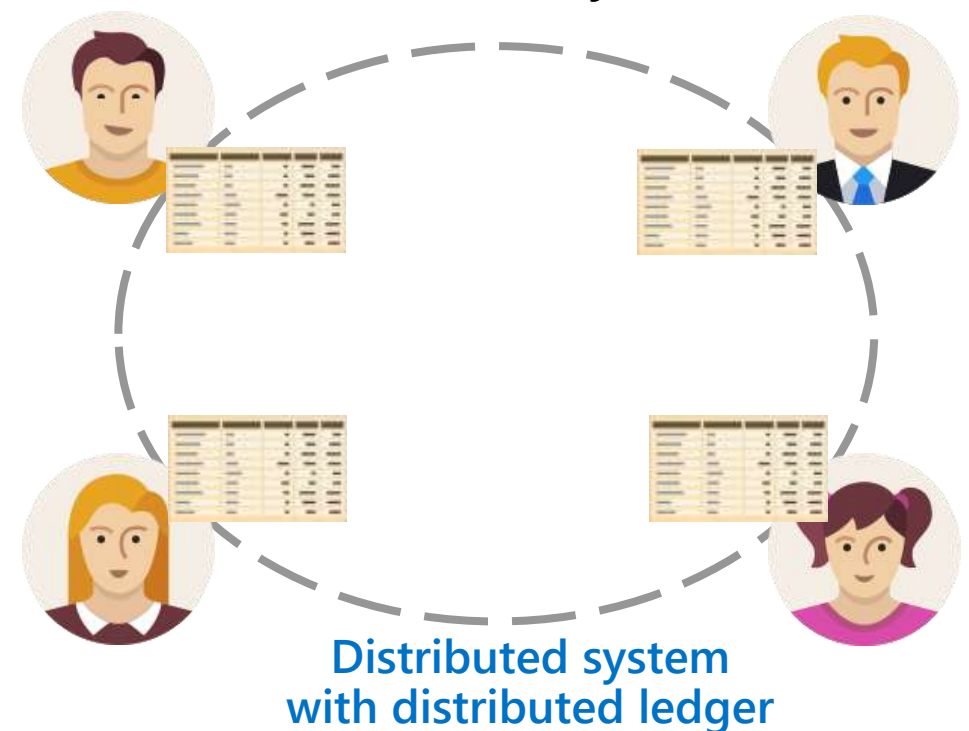
# That decentralizes data in a trustless environment

- Traditional ledgers are centralized and use third parties and middlemen to approve and record transactions
- Blockchain safely distributes ledgers across the entire network and does not require any middleman
- The technology maintains multiple replicas like P2P torrent file sharing

## Traditional System



## Blockchain System

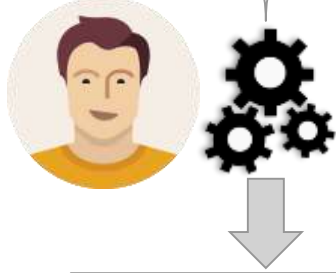


# Basic blockchain to track financial transactions

EXAMPLE

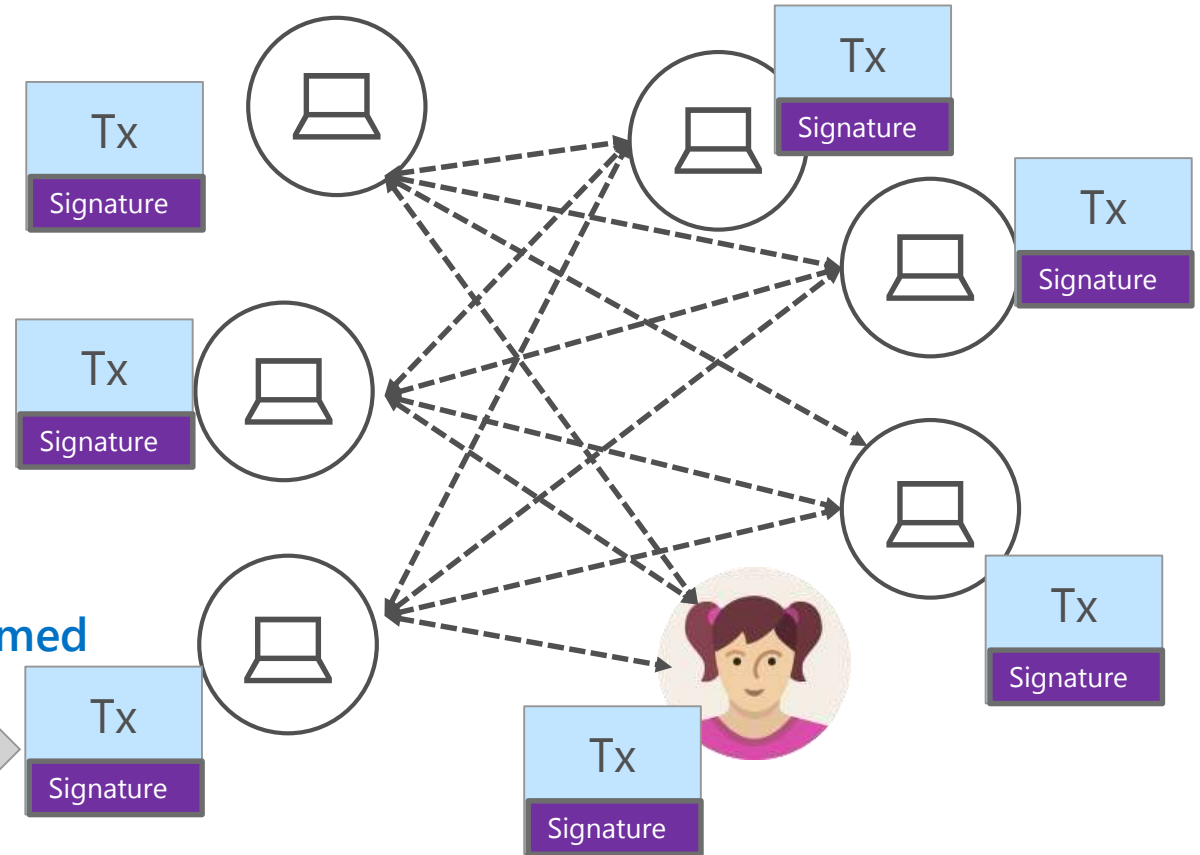
In this example, Alex wants to send Katie \$500 via a financial transaction blockchain system

FROM	TO	PROPERTY	VALUE
Alex	Katie	Payment	\$500



Transaction (Tx)  
From: Alex (0xf5e...)  
To: Katie (0x992...)  
Amount: 500  
Digital signature  
0x23e423s3234...

2. Transaction is confirmed  
though mining.

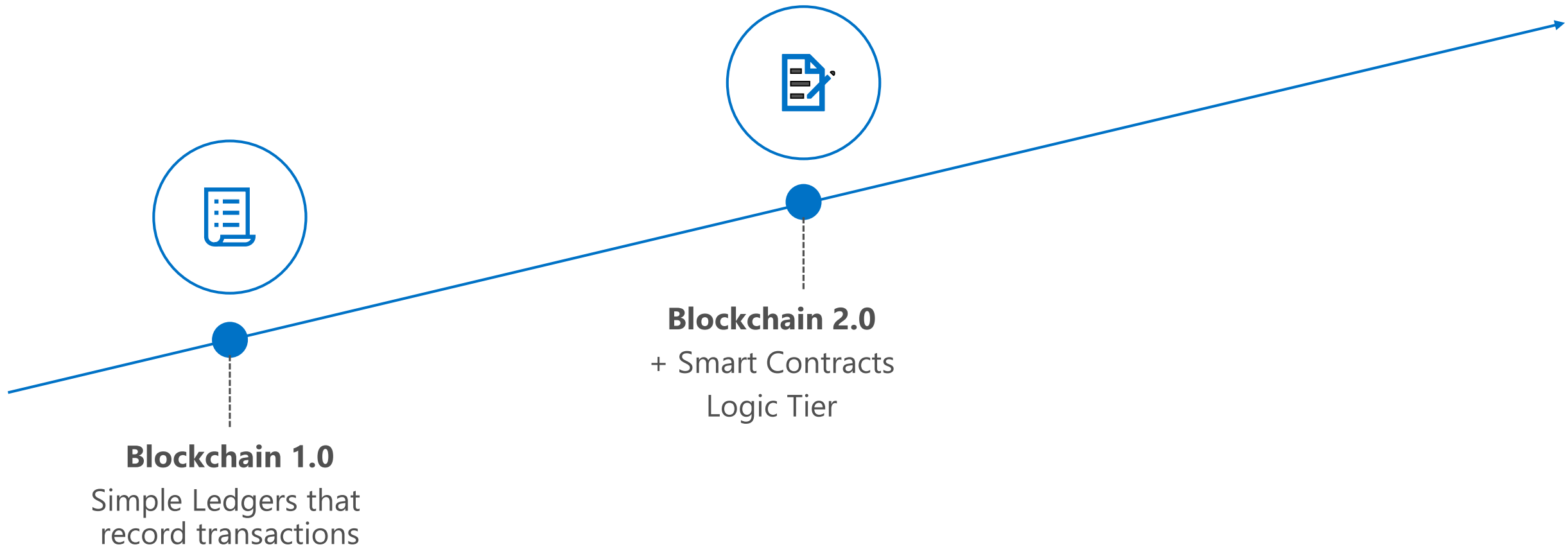


1. Transaction information goes  
through hash functions (to secure  
it as well as create a time stamp)

3. Confirmed transaction  
gets pushed to network

# Evolution of Blockchain

## *Blockchain 2.0 – Introducing Smart Contracts*



*Smart Contracts are unable to access external data or events based on time or market conditions. Calling code or data outside of a Smart Contract or blockchain breaks the general trust barrier and authenticity of transactions. Cryptlets will allow the blockchain to access external data securely, while maintaining the integrity of the blockchain.*

# Blockchain 2.0 | Smart Contracts

# Traditional Contract

[illegible]

## Smart Contract Package

## Logic



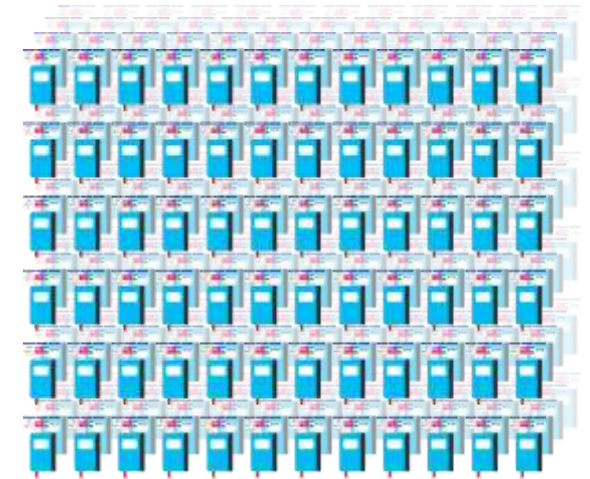
## Properties



## Ledger

Date	Payment	Late Fee
12/1/2016	\$500.00	\$0
1/1/2017	\$500.00	\$0

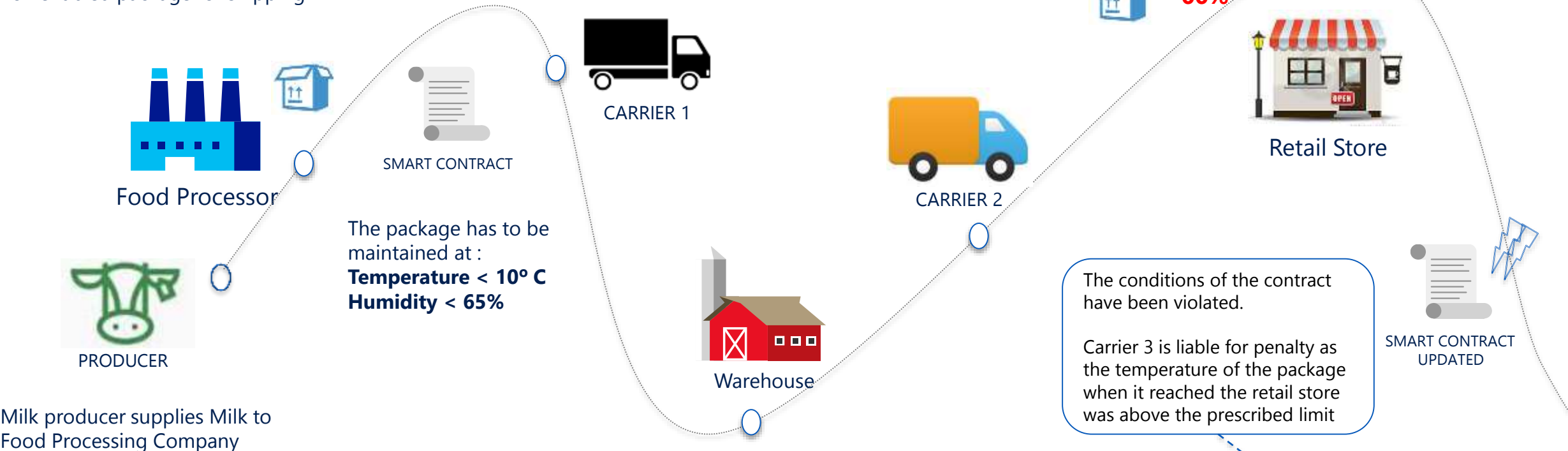
## Deployed to Nodes



# Detailed Use case - Supply Chain with IoT and blockchain

The Food product is sealed in an IoT enabled package for shipping

The terms of shipping are registered using a **smart contract** on the Blockchain



At various points in the journey, the IoT device from the package sends the Temperature & Humidity data which are recorded on the blockchain



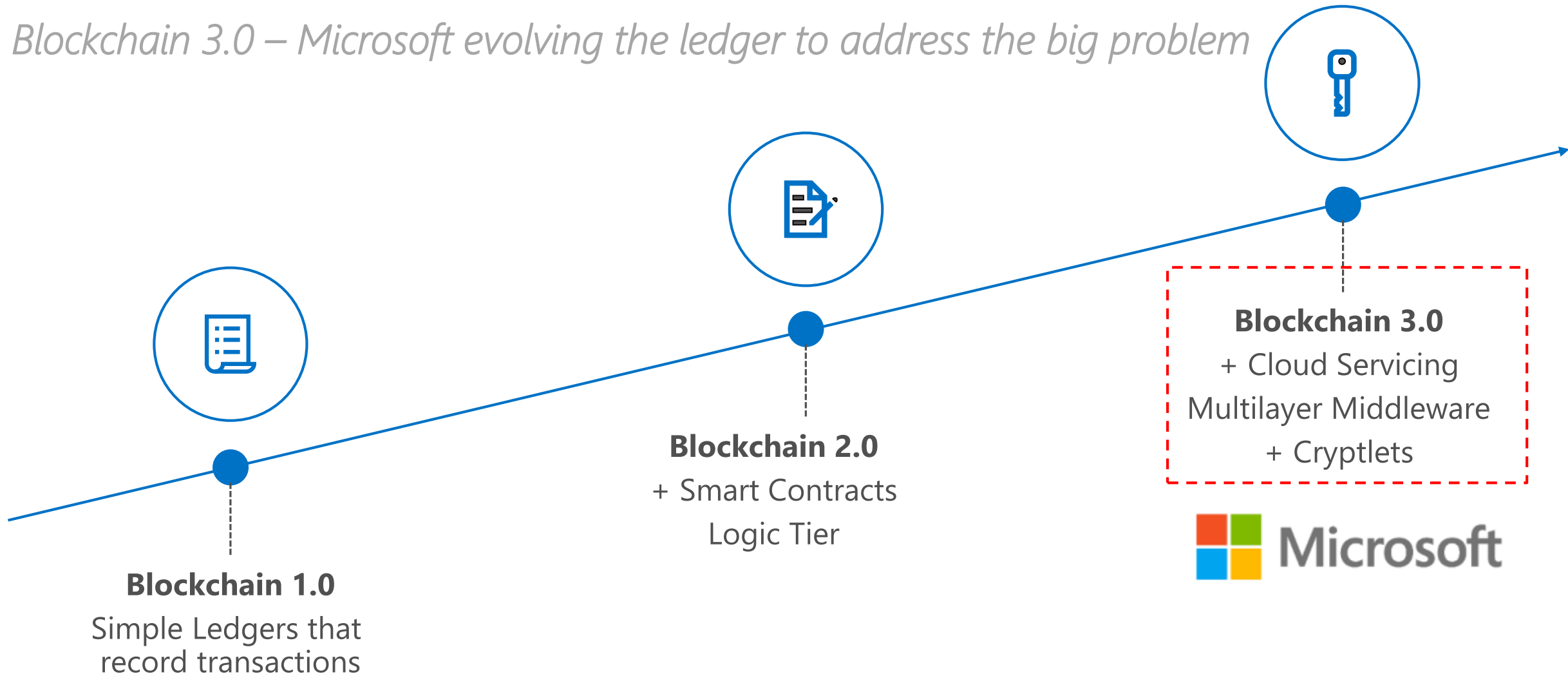
SHARED LEDGER			
Origin	8°C 60%	Warehouse	9°C 64%
		Carrier 2	9°C 64%
		Store	11°C 66%

# Blockchain 2.0 | Changes from 1.0

Blockchain 1.0		Blockchain 2.0	POTENTIAL BENEFITS
Bitcoin Blockchain	➡	Ethereum, Corda, Hyperledger, Sawtooth Lake, many others yet to come	Not locked into one vendor
Simple Transactions	➡	Generic Contracts	Can handle more complex needs
One Blockchain	➡	Multiple, Linked Blockchains	Can partition information & pick different chains for different needs (location, regulation, speed, privacy, etc.)
Public Only	➡	Public, Private, Consortium, or Domain Specific	Solves many regulatory and privacy needs
Proof of Work Only	➡	Different ways to reach Consensus improvement for need – Proof of Work, Stake, Identity, Vote, etc.	Overcomes some of the existing Blockchain issues such as speed and computational cost
Continually Open & Distributed	➡	User Choice	Craft blockchain solutions around the business needs

# Evolution of Blockchain

*Blockchain 3.0 – Microsoft evolving the ledger to address the big problem*

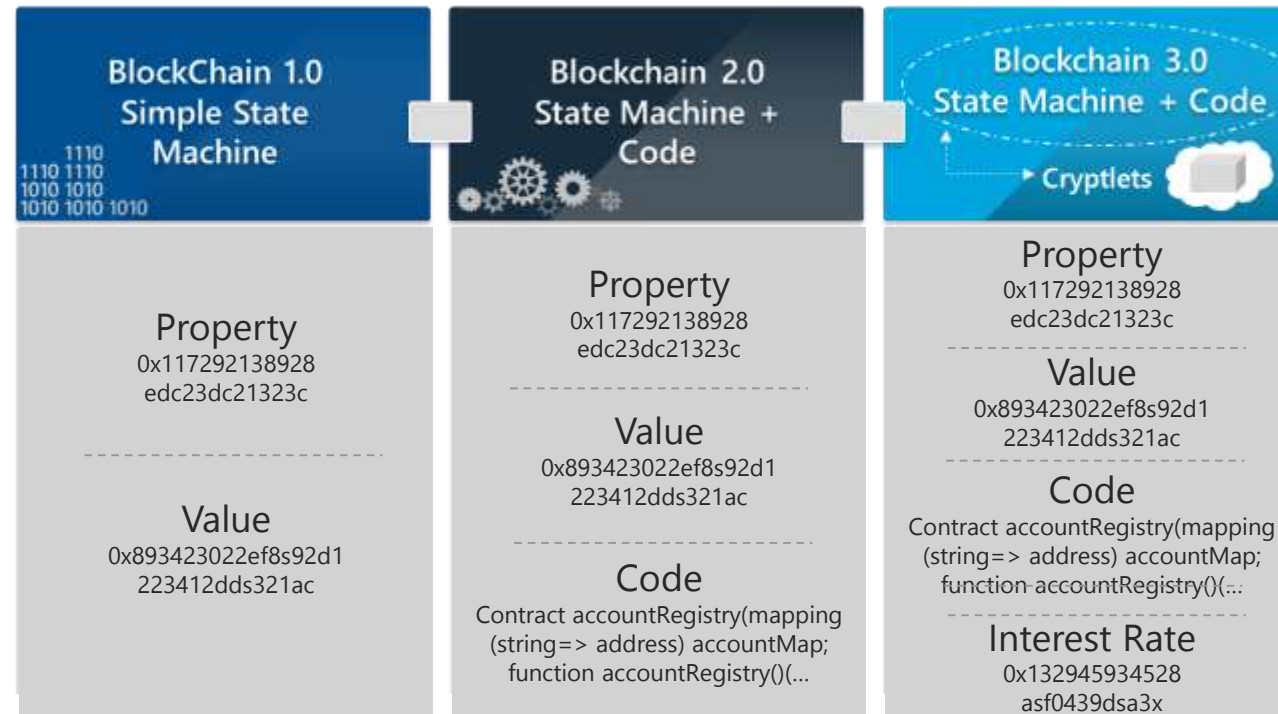


*Smart Contracts are unable to access external data or events based on time or market conditions. Calling code or data outside of a Smart Contract or blockchain breaks the general trust barrier and authenticity of transactions. Cryptlets will allow the blockchain to access external data securely, while maintaining the integrity of the blockchain.*



# Blockchain 3.0 | State-of-the-art **cryptlets** innovation

- Blockchain 2.0 introduced the power of Smart Contracts...
- ...but Smart Contracts are unable to access external data or events based on time or market conditions
  - Calling code or data outside of a Smart Contract or blockchain breaks the general trust barrier and authenticity of transactions
- Cryptlets will **allow the blockchain to access external data securely, while maintaining the integrity of the blockchain**
- Cryptlets are a Microsoft innovation and solve a significant hurdle to enterprise blockchain adoption



# Real World Problem: Counterfeit Pharmaceuticals

**10%-30%** of drugs sold in developing countries are **counterfeits**.

**80%** of the counterfeit drugs consumed in the US come from overseas.

Prescription drugs market is estimated at **\$900 billion worldwide**.

The global market for counterfeit drugs is **\$200 billion** dollars.

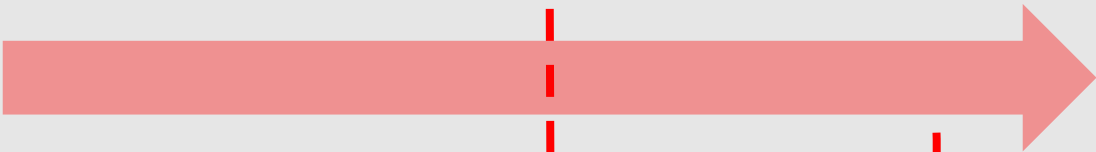
The global market for counterfeit products is **\$460 billion** dollars.

More than **30%** of counterfeit drugs **do not contain** any **active** ingredients.



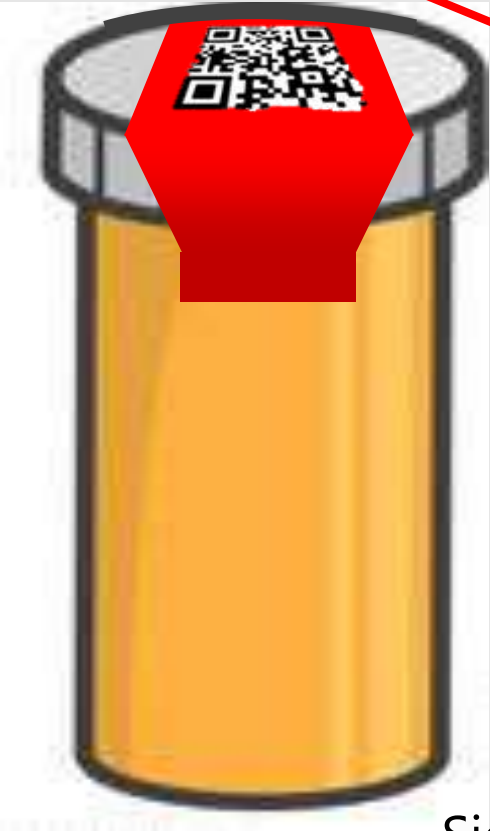
# Solution: Two-Layer QR Code Label ...

Before



After

Top (red)  
layer



Side View    Top View



Side View

Bottom (yellow)  
layer



# Blockchain Technology Market and Use Case Scenarios

# State of the Blockchain market



# Blockchain Scenarios for all Industries



## Financial

Redesign high-cost legacy workflows, improve liquidity and free up capital. Help **reduce infrastructure costs**, increase **transparency**, **reduce fraud** and **improve completion and settlement times**.



## Healthcare

Removes third-party verifiers such as health information exchanges by directly linking patient records to clinical and financial stakeholders. Provides **fast, security-enhanced**, authenticated access to personal medical records across healthcare organizations and geographies.



## Construction

Together with Building Information Technology (BIM) can be used to streamline **compliance** and **solve issues with trust and verification** in the whole process.

**Reduce cost and time** related to payment disputes by allowing participants to create contracts that force them to move through a certain checklist before being paid.



## Retail & Manufacturing

Improved supply chain management, smart contract platforms, digital currencies, and **cybersecurity**.



## Government

Increase transparency and **traceability of how money is spent**. Track asset registration, such as vehicles. **Reduce fraud and operational costs**.





# Trade Finance – Traditional state



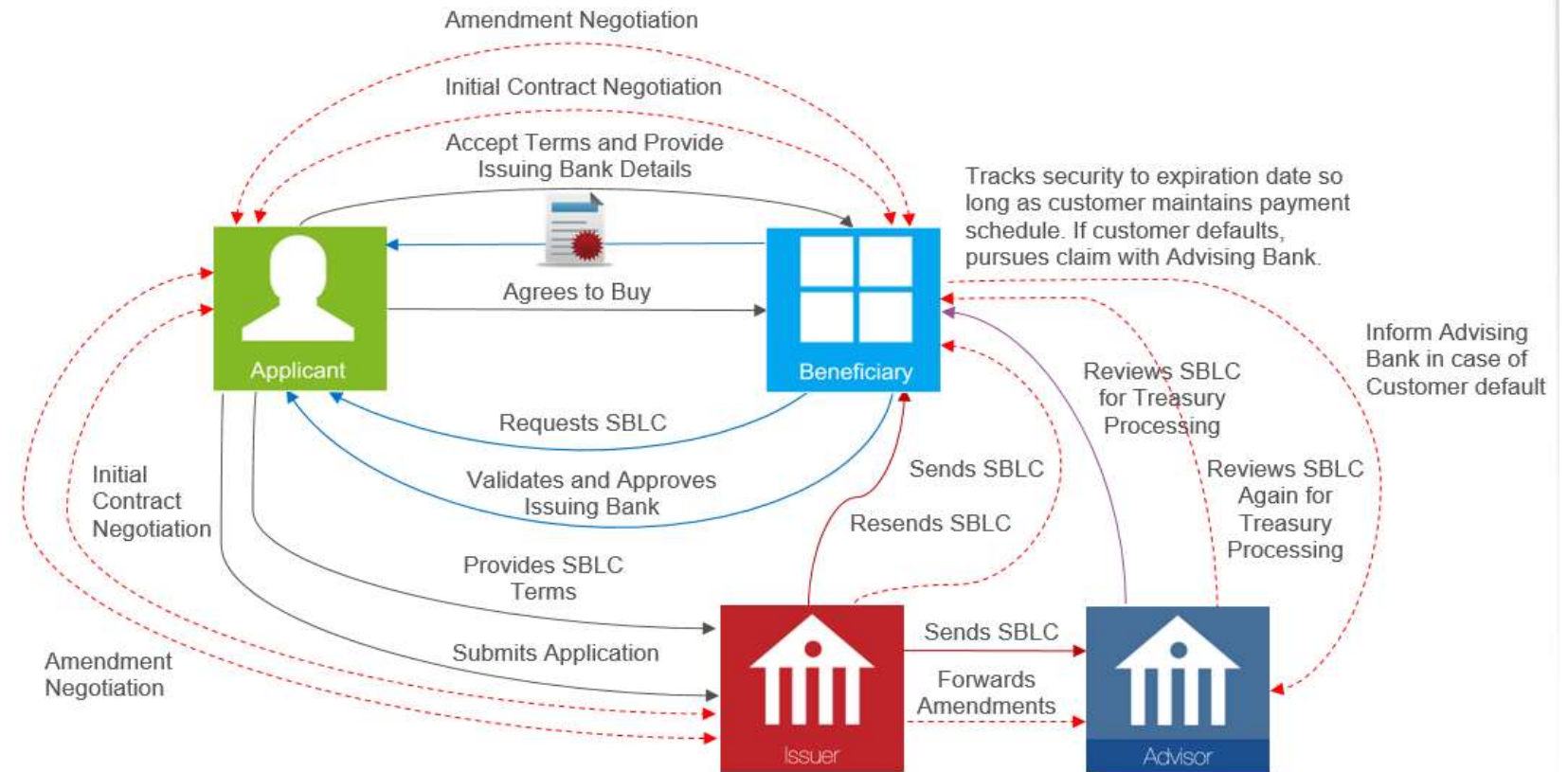
Financial

In an ever increasing global commercial landscape, automating the operational link between Trade Finance and cash flow is paramount to Treasurers, whether you are Buyer, Seller, or Issuing / Advising/Confirming Bank.

**Operational Inefficiencies:** Manual, Paper-Driven, Time Consuming, Lack of Standardization

Working capital/  
balance sheet  
implications

Lack of visibility, not  
knowing holistic  
exposures



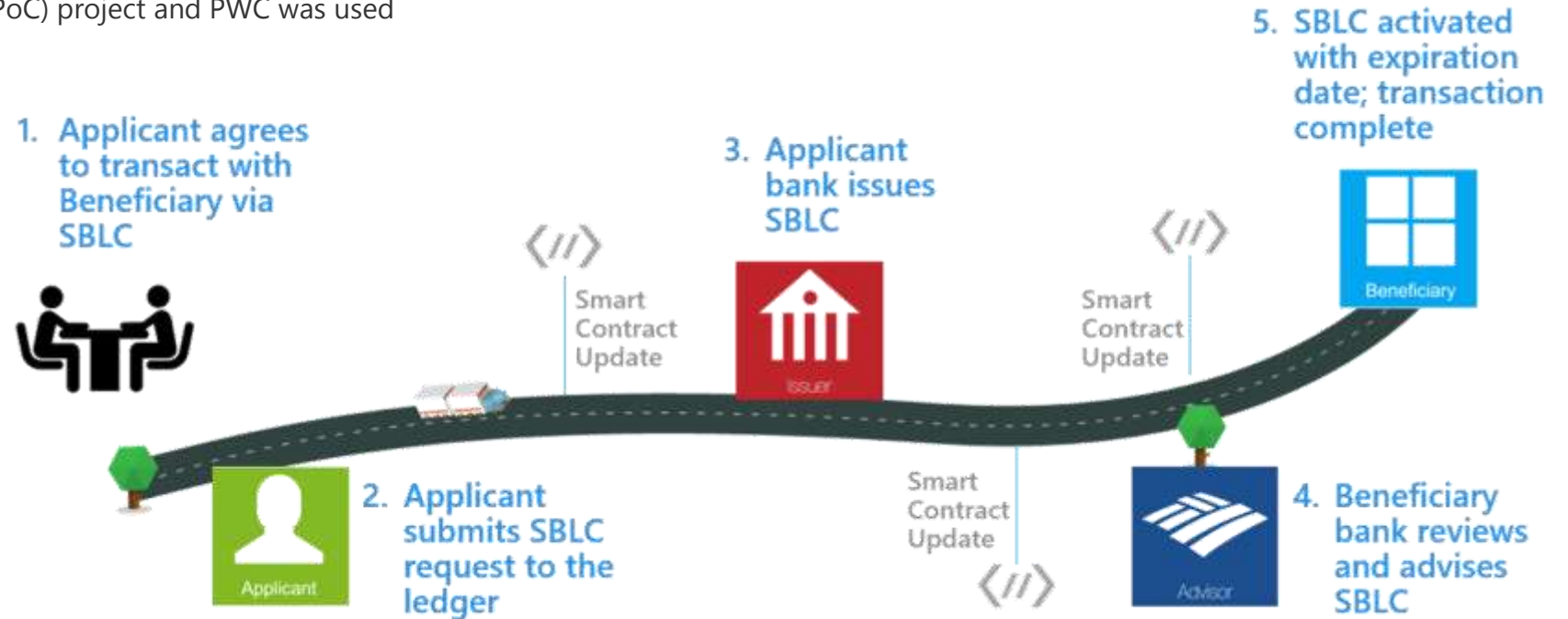
# Trade Finance in a blockchain world



Financial

Microsoft Treasury and Microsoft BaaS (Blockchain as a service team) worked with Bank of America to automate the issuance and advising of the SBLC process using Blockchain. This was done as a Proof of Concept (PoC) project and PWC was used for building this solution.

Blockchain based SBLC process:



Speed and Efficiency of Execution

Real-time data and Audit Trail

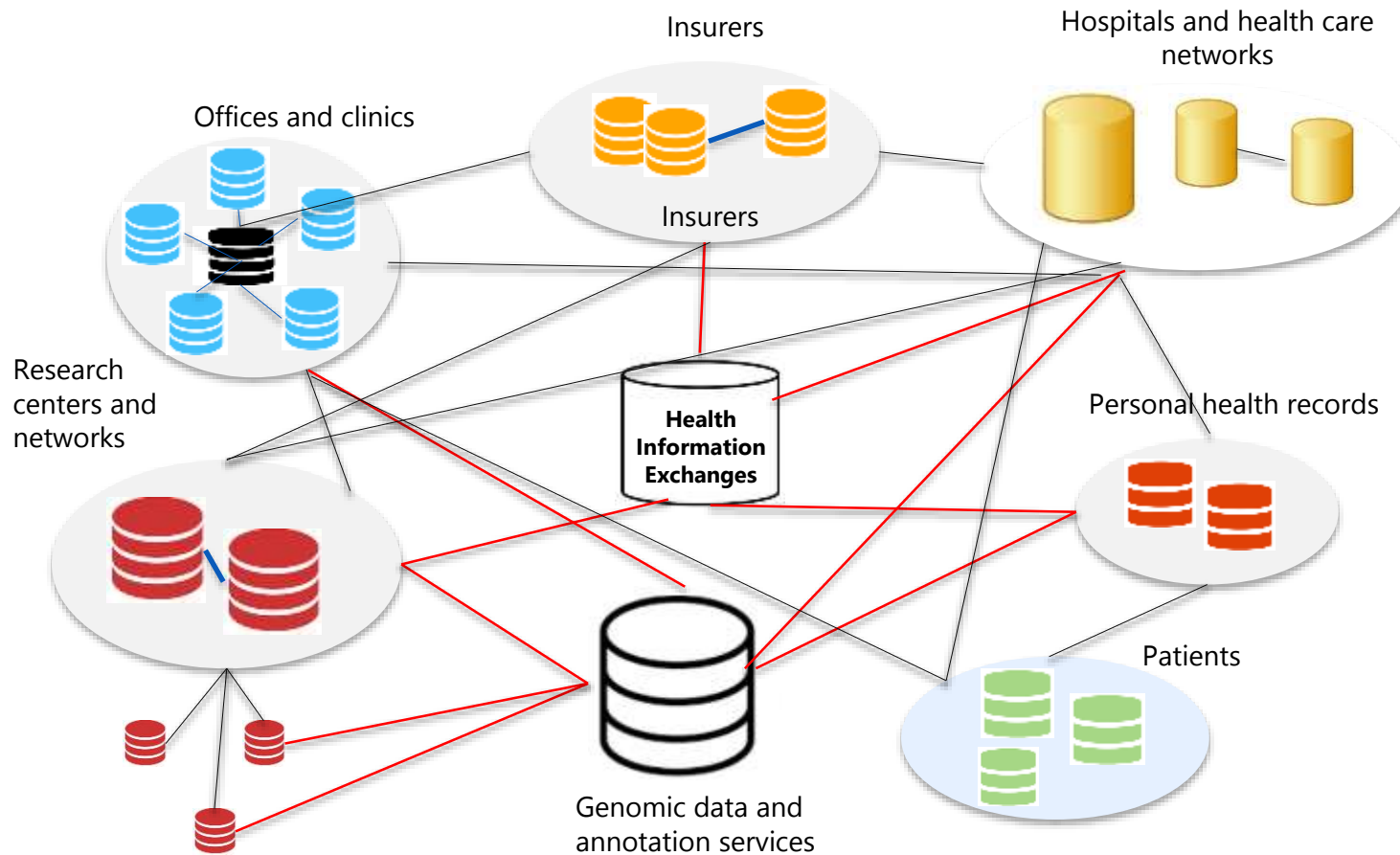
Transparency across all participants

**This PoC was a collaborative effort to reflect a “true” SBLC scenario, and included the following parties:**

- Beneficiary (Seller) : Microsoft
- Applicant (Buyer/Customer) : Sample Customer
- Issuing Bank (Buyer/Customer) : Sample Bank
- Advising Bank : Bank of America



# Health care – Current State



## Challenges

**Establishing a Trust Network** depends on the HIE as an intermediary to establish point-to-point sharing and "book-keeping" of what data was exchanged

**Cost Per Transaction**, given low transaction volumes, reduces the business case for central systems or new edge networks for participating groups.

**Master Patient Index (MPI)** challenges arise from the need to synchronize multiple patient identifiers between systems while securing patient privacy

**Varying Data Standards** reduce interoperability because records are not compatible between systems

**Limited Access to Population Health Data**, as HIE is one of the few sources of integrated records

**Inconsistent Rules and Permissions** inhibit the right health organization from accessing the right patient data at the right time



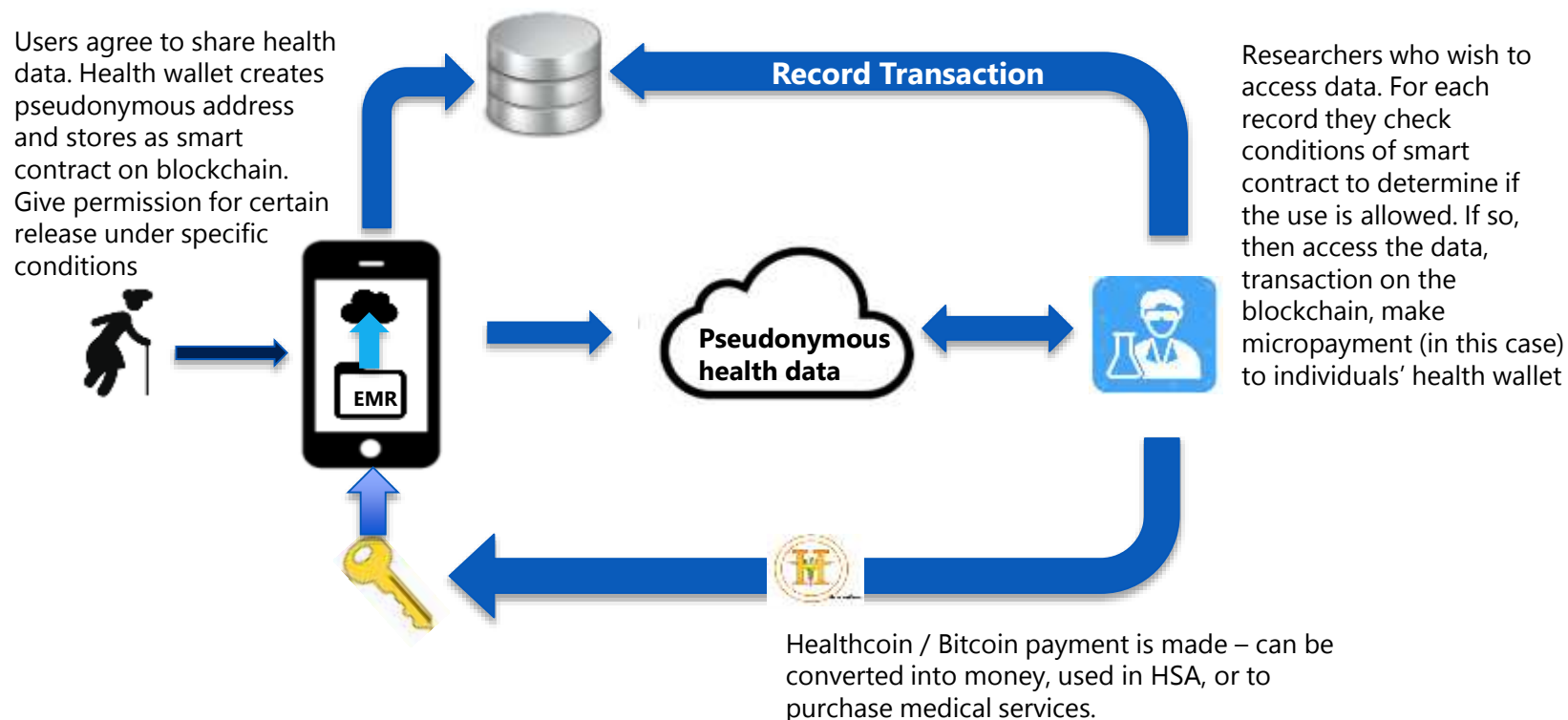
# Health care in a block chain world

Blockchain can be used as mechanism to create a shared data commons for medical R&D

## Use Case Description

Health research could be conducted by aggregating personal health records stored on the Blockchain. Users contribute their health data to a public data commons managed via Blockchain. Data is encrypted pseudonymous form and payment made via bitcoin, or different kinds of HealthCoin. Data on the Blockchain is that it can be analyzed but remain private.

## Blockchain and data of commons



## Benefits

- It ensures **privacy and security** for the owner of the data;
- It allows the data owner to see when the data has been used (i.e., as a transaction of the Blockchain); and
- Gives the **individual ownership of their health record**.
- Personal health records would be stored and administered via Blockchain in an EMR system
- Users would permission doctors and other parties into their records as needed
- Blockchain could create a **secure method of health information** (e.g., proof-of-insurance, vaccination status, test results, prescriptions, status, condition, treatment, and physician referrals)



### Blockchain-based EMRs

- Personal health records would be stored and administered via Blockchain in an EMR system.
- Taking advantage of the **pseudonymous** (e.g.; coded to a digital address not a name) nature of Blockchain technology, **personal health records** would be encoded as digital assets and put on the Blockchain just like other assets like currency.
- Users would permission doctors and other parties into their records as needed via their private key



### Health Documentation, Validation and Tracking

- Blockchain could create a secure method of health information (e.g., **proof-of-insurance, vaccination status, test results, prescriptions**, status, condition, treatment, and physician referrals)



### Secure Health Data Commons

- **Health research** could be conducted by aggregating personal health records stored on the Blockchain
- Users contribute their health data to a public data commons managed via Blockchain
- Data is encrypted pseudonymous form and **micropayment made via bitcoin**, or different kinds of HealthCoin. Data on the Blockchain is that it can be analyzed but remain private



### Health Vendor RFPs and Pharma Supply Chain

- Health service providers could bid to supply medical services needed by patient-consumers on smart contract markets. Like Uber drivers, service providers could bid on needed health services



- Robomed Network enables payments based on Patient satisfaction
- Pharma companies can leverage Smart contracts for Supply Chain Management



# Blockchain in Government and Public Sector

## Ownerships

- Land (and other asset such as vehicles) Registries
- Register and manage documents with transparency
- Reduce time spent in issuing, verifying, renewing, replacing records
- Self service – **verify documents** through the network
- Public Asset Management
- **Food and Drug Safety** (food supply chain tracking)
- Example: **Ghana Land Registration Pilot with BitLand**



## Identities

- Blockchain e-identities to its citizens for services like **voting**
- **E-Residency Program by Estonia**
- To publish secured, anonymized healthcare data
- Patient controls who can access his data



## Verification

- Manage **Taxation and Fraud Evasion** By Triple Entry Accounting on the blockchain. Single version of the truth for invoicing  
Example: **Singapore** fighting invoice fraud of traders with banks
- Licenses & other Proofs of records (**degrees, grades, etc.**) can be recorded & distributed
- **UK Govt** leveraging Block Chain to Track eligibility, registration & payments for **Govt grants and benefits**



## Movement of assets

- Transferring money from one person/entity to another.
- Enabling direct payments, once a work condition has been performed.



# Blockchain in Retail and Manufacturing

## Supply Chain Transparency

- **Provenance** uses Blockchain to help promote environmentally **sustainable production and social good**
- Consumers are increasingly concerned with ensuring that the food they buy comes from responsibly-managed sources. **Walmart** is tracking product from Farm all the way to store shelves
- Blockchain technology allows for the transparent recording of whether say a fish has been sustainably caught, its freshness, and whether it has been handled in compliance with social and environmental rules



## Diamond Verification/ Check Counterfeit Products

- Blockchain technology is being used to give each Diamond stone an **unique identifier**
- **Everledger**, a permanent register for diamond certification uses Smart contracts to assign each asset a unique identifier
- If a duplicate appears on the Blockchain without proper authorization, it can easily be identified as counterfeit



## Consumer Marketing – Digital Identities

- To be the sole repository of a singular digital ID for every person on the planet; project worked upon by Onename and **Bitnation's Digital Identity**
- Disrupt CRM where the company stores data about the customer, and uses it or sells it => **Where Consumer owns his/ her data**, and is shared with whom one wants, and s/he **gets paid** for by companies to buy it and use it (to market it to the individual)
- Facebook, Google and Apple make money each year where we give them our data for free, they then onsell that data to those who want to market to us. **Consumer marketing could get completely flipped from company led push retail, to consumer secured pull**



## Maintenance and Pre-order

- **IoT devices** track the state of safety of critical machines and their **maintenance** in your organization
- From **aircraft engines to elevators** blockchain provides for a tamper-free ledger of operational data and the resulting maintenance
- Third-party repair partners can monitor the blockchain for preventive maintenance and record their work back on the blockchain.
- Initiate and Pre-order Parts for required maintenance
- Operational **records** can also be shared with government entities **to verify compliance**





# Blockchain For Social Good



The World Food Programme has been using an ethereum-based blockchain technology to help refugees of the Syrian civil war.

The United Nations World Food Programme (WFP) is deploying cutting-edge blockchain technology to make cash-based transfers faster, cheaper and more secure.

## 1.1 BILLION PEOPLE LIVE WITHOUT AN OFFICIALLY RECOGNIZED IDENTITY

THIS LACK OF RECOGNIZED IDENTIFICATION DEPRIVES THEM OF PROTECTION, ACCESS TO SERVICES, AND BASIC RIGHTS. ID2020 IS A PUBLIC-PRIVATE PARTNERSHIP DEDICATED TO SOLVING THE CHALLENGES OF IDENTITY FOR THESE PEOPLE THROUGH TECHNOLOGY.

Identity is foundational for political, and economic opportunity.

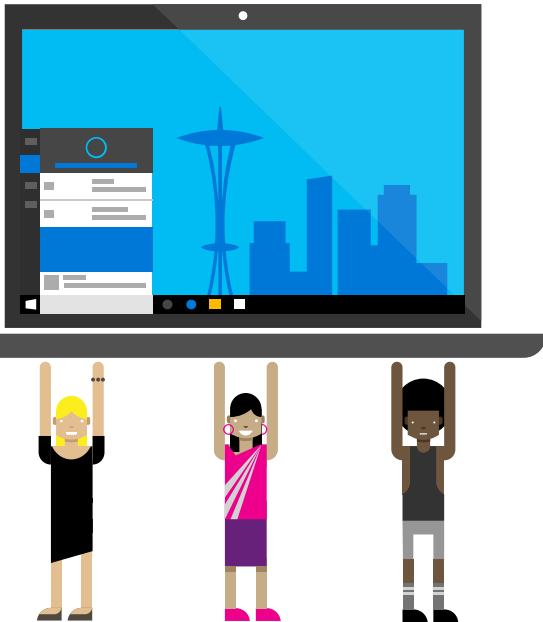


A sample of potential public & private services that require a proof of identity

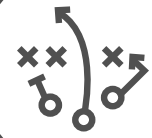
## Moldova to Use Blockchain Identities to Fight Child Trafficking



# How do you get started?



**BLOCKCHAIN BUSINESS IDEATION WORKSHOP**



**SETUP BLOCKCHAIN NETWORK FOR PILOT OR TEST SCENARIO**



**START BUILDING OUT SCENARIOS AND APPS**



**LEARN FROM PILOT and DEVELOPMENT FOR BLOCKCHAIN**



. @HamdanMohammed Launches #Dubai Blockchain Strategy, 100% of Government Documents to be on the Blockchain by 2020

# Q&A

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# Thank You