

Blockchain and It's Practical Use Cases

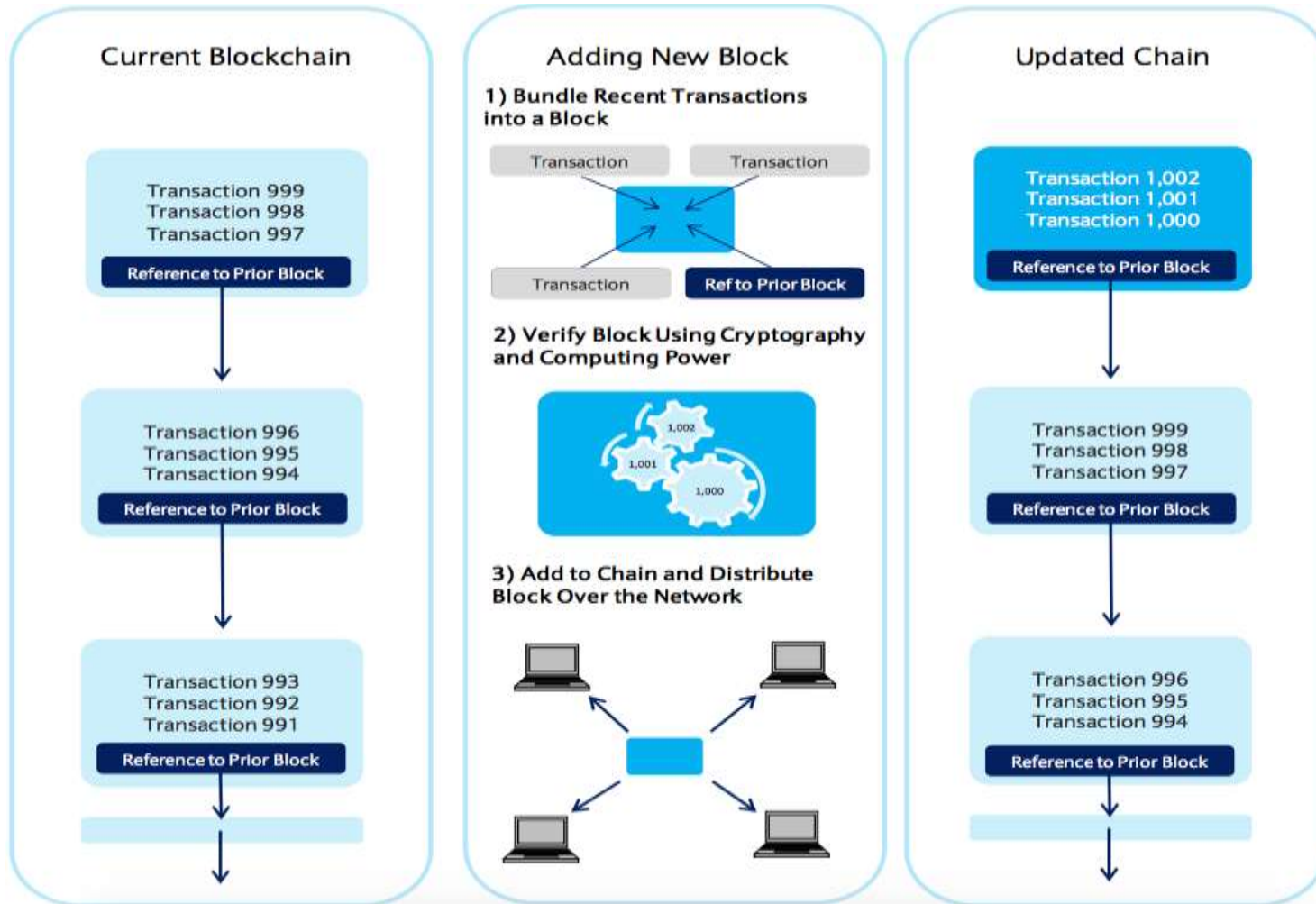
Ken Bradberry, CTO Xerox Healthcare



What is Blockchain?

- A blockchain is a data structure that makes it possible to create a digital ledger of transactions and share it among a distributed network of computers.
- It uses cryptography to allow each participant on the network to manipulate the ledger in a secure way without the need for a central authority.
- Once a block of data is recorded on the blockchain ledger, it's extremely difficult to change or remove.
- When someone wants to add to it, participants in the network — all of which have copies of the existing blockchain — run algorithms to evaluate and verify the proposed transaction.
- If a majority of nodes agree that the transaction looks valid — that is, identifying information matches the blockchain's history — then the new transaction will be approved and a new block added to the chain.

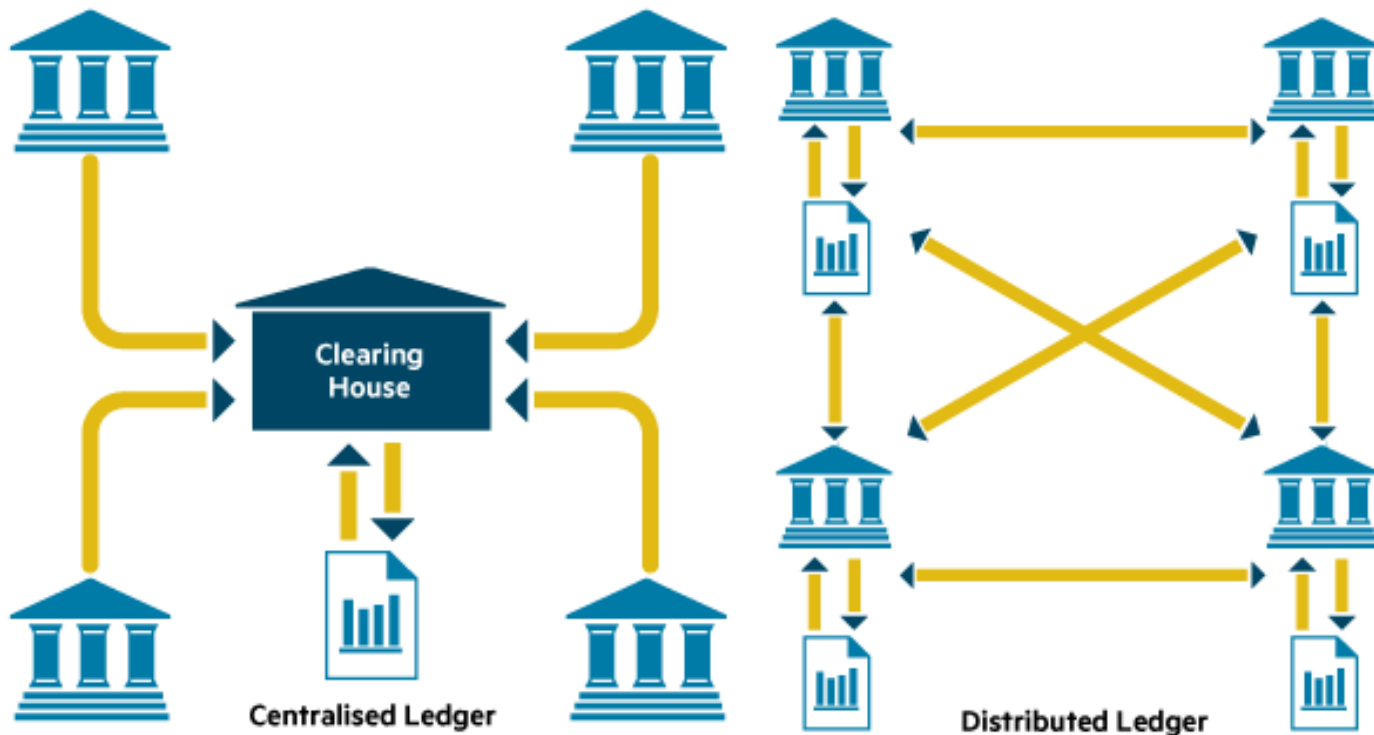
Block Chain Diagram



Blockchain Example

Embedding distributed ledger technology

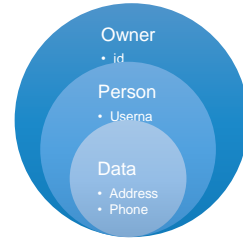
A distributed ledger is a network that records ownership through a shared registry



In contrast to today's networks, distributed ledgers eliminate the need for central authorities to certify ownership and clear transactions. They can be open, verifying anonymous actors in the network, or they can be closed and require actors in the network to be already identified. The best known existing use for the distributed ledger is the cryptocurrency Bitcoin

FT graphic. Source: Santander InnoVentures, Oliver Wyman & Anthemis Partners

Basics – Tokenization (public/private keys)

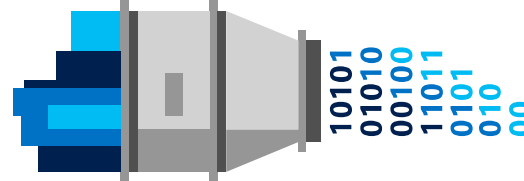


Create a Secure Identity
for Everything

Digests:

0x23e423s3234...
0x4e231323134...

Cryptographic one-way hash



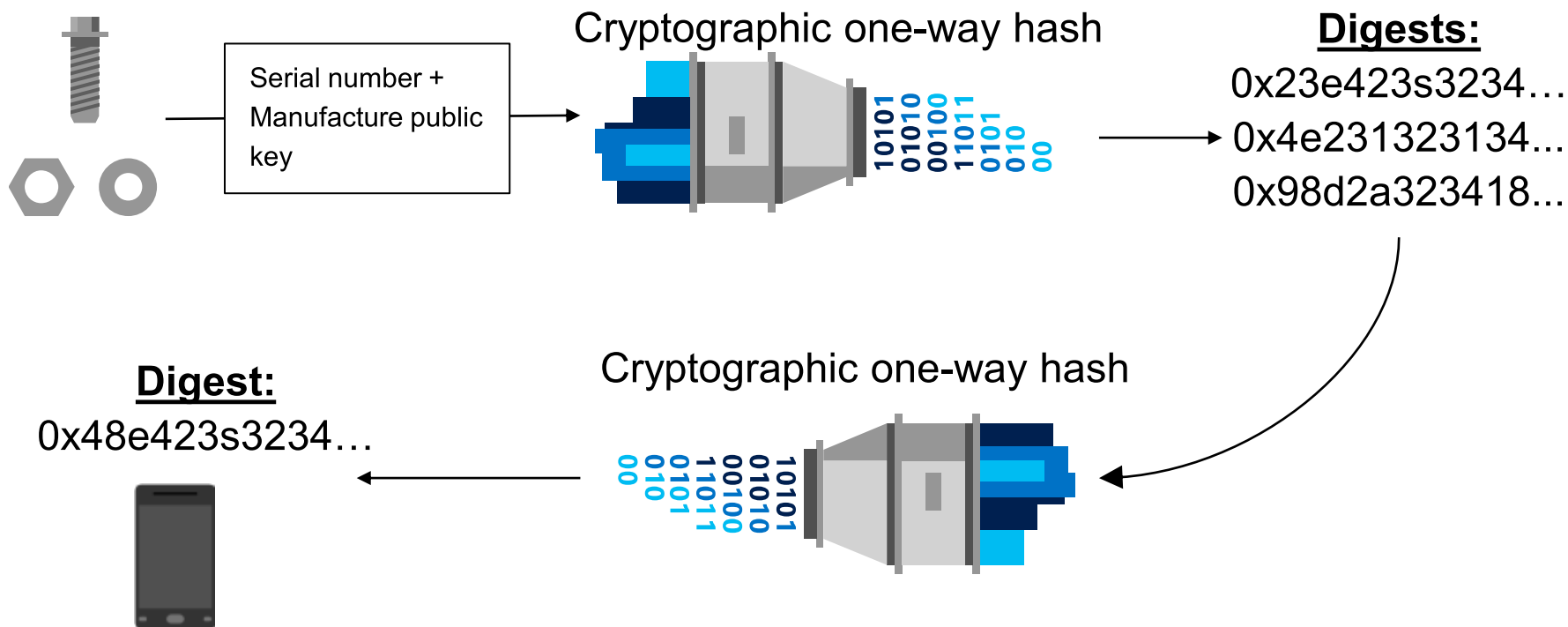
Token -
0x23e423s3234...
Owner -
0xfe839a340d...

Username +
Password +
Biometric data

Private key

Public key

Basics – Tokenization composites

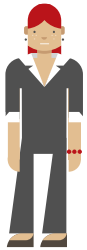


Slides courtesy of Microsoft

Basics – Ownership – Introduce a ledger

Digest/Public key:

0x23e423s3234...



Digest/Public key:

0x67d3a3s3234...



owns

Digest/Public key:

0x48e423s3234...



sells



owns

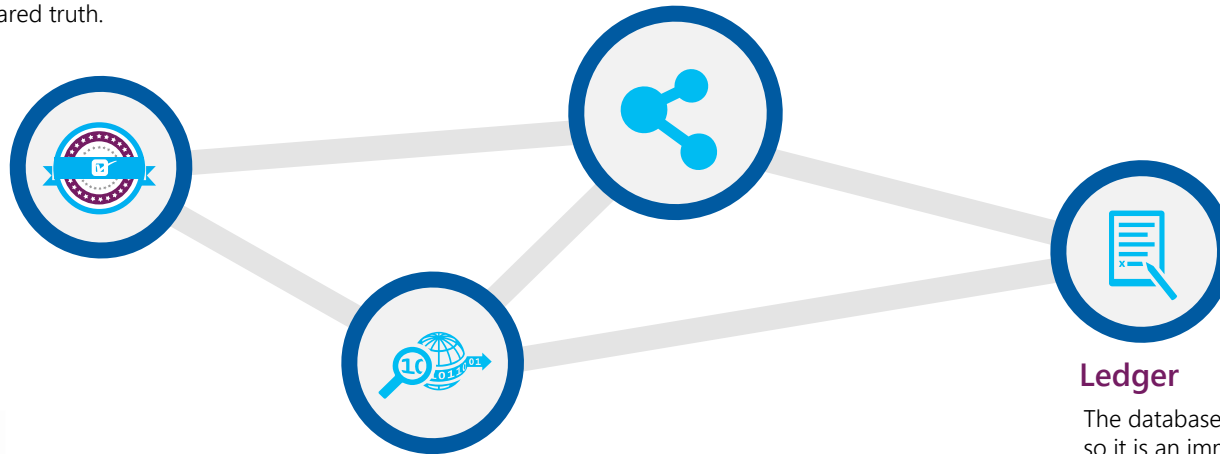
Blockchain | Overview

Cryptographically Authentic

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

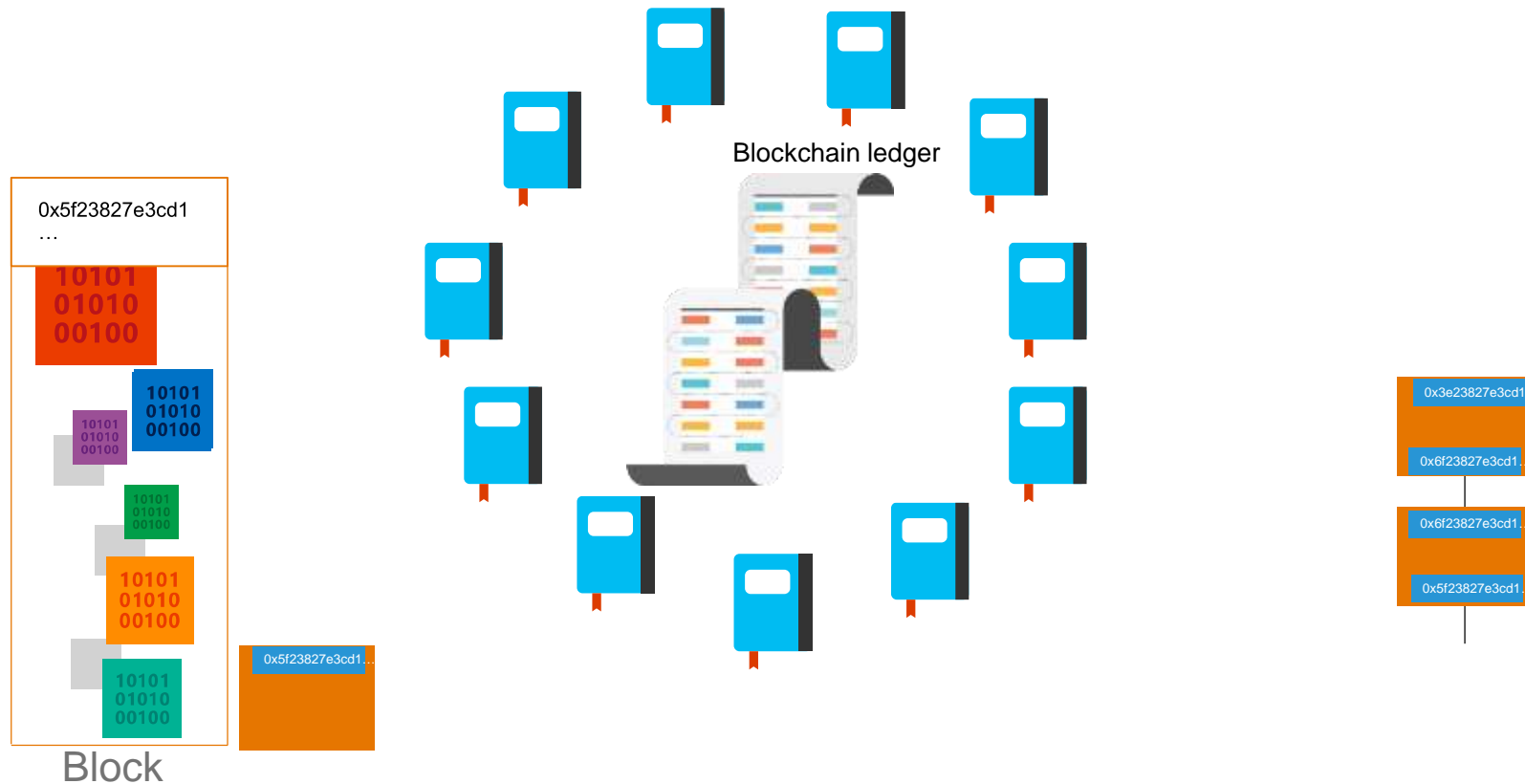
There are many replicas of the Blockchain database. In fact, the more replicas there are, the more authentic it becomes.

Ledger

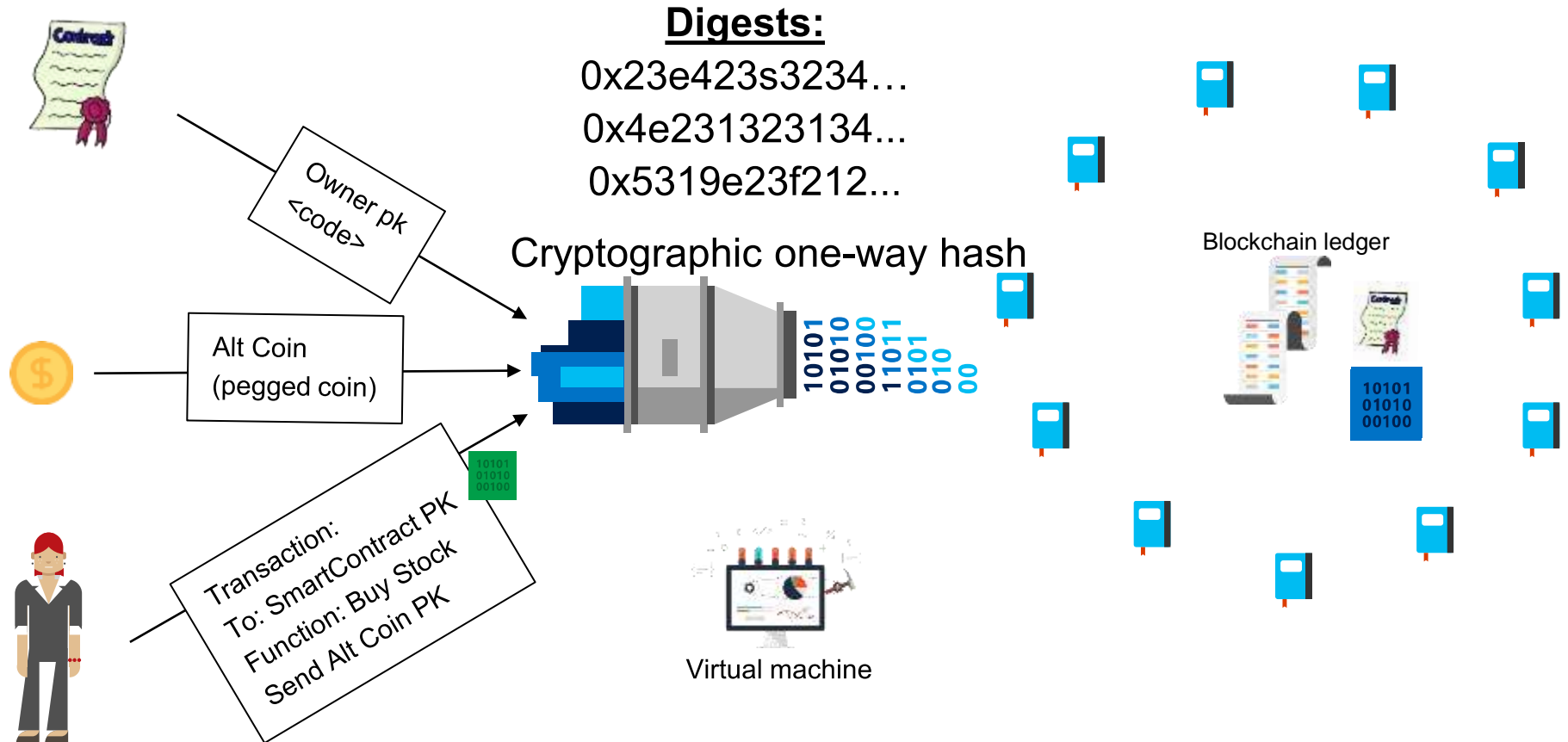
The database is a read/write-once database so it is an immutable record of every transaction that occurs.

Slides courtesy of Microsoft

Cryptographically authentic shared distributed ledger



SmartContracts



Practical Use of Block Chain - Financial

Payments and Remittance – Transactions can occur directly between two parties on a frictionless P2P basis. The technology's application for overseas transactions has the potential to reduce risk, transaction costs and to improve speed, efficiency and transparency.

Issuance, Ownership and Transfer of Financial Instruments – A blockchain-based securities market allows traders to buy or sell stocks directly on exchanges or directly to other market participants in a P2P manner without the intermediation services provide by a broker or clearinghouse.

Clearing and Settlement Latency – On the blockchain, the entire lifecycle of a trade, including its execution, clearing and settlement can occur at trade level, lowering post-trade latency and reducing counterparty exposures.

Practical Use of Block Chain - Healthcare

Smart Contracts – Smart contracts would automatically pay providers when conditions of service are established such as;

- Validation that a service was received by a registered Medicaid patient
- Service was provided by a properly registered doctor & provider
- Neither party is on a known list of past participants in any fraud

Cost Containment – The block chain can be filtered to identify and alert about specific activity on the chain, monitoring, using patterns, can include data that represents a doctor, consumer, drugs, procedures, all can be tokenized and added to the chain.

- Building a rule base using best practices, CPT codes, ICD codes, medical procedures and other costs can be monitored and audited using blockchain.



Practical Use of Block Chain - Healthcare

EHR storage & security - Blockchain is a security technology at its core and with the ever-present concern over the security of electronic health records, it is likely to cater to this challenge first as it enters healthcare. This approach can secure medical records and audit trails using the Blockchain.

- We can do this by cryptographically encoding private medical data and then a digital fingerprint is formed for time-stamping and verification purposes.

DNA wallets – This concept stores genetic and medical data which is again secured via the blockchain and accessed using private keys and this will form a “DNA wallet”. This could allow healthcare providers to securely share – and possibly monetize – patient data, helping pharmaceutical companies to tailor drugs more efficiently.

Practical Use of Block Chain - Healthcare

Anti-counterfeit drugs – The industry is designing blockchain in the fight against counterfeit drugs. It features panels on drug packages that can be peeled or scratched off to reveal a unique verification tag. This is then cross referenced with the blockchain to ensure that the pharmaceutical product is legitimate.

Protein folding - Stanford University previously relied on expensive super computers to simulate protein folding as it happens incredibly fast.

- This method was obviously costly and had a single point of failure. Using the blockchain, they can instead use a decentralized network of over 170,000 computers to produce 40,000 teraflops of computing power.
- This example will grab the attention of other industries that utilize expensive supercomputers. This could even make its way into the analytical space by utilizing a broad base of data for predictive analytics.



Block Chain – Healthcare example

The challenge when defining block chain technologies is how to position it for the future. This use case explores patient identity and the delivery of EMR and other patient information necessary to deliver healthcare.

- In the world that we live in and increasing over time is that each human or patient is actually a conglomerate of a huge variety of data.
- In the past have had EMR's and maybe that was adequate.
- The patient of the future is a composite of EMR data and the data from other provider EMR's be it a hospital, ambulatory or urgent care, pharmacies, genomic data, huge data set from our wearables, survey's, implants and IoT.

Block Chain – Healthcare example

- The patient of the future is a vast collection of data.
- Currently when someone comes into a healthcare institution, all we have today is a small database of data, and has some file that is separated and might be faxed or in stacks of paper.
- With that requires a form of identity that connects that patient to the data they are carrying or in a variety of databases where MR numbers are different and patient information can be inconsistent.
- The potential of block chain utilized by the payer and provider can streamline this process.
- The healthcare entities would join a block chain to have access to a large network of verified and secure data.

Block Chain – Healthcare example

- When a patient comes to the hospital and wants care, the provider has a method to see all the imaging data, EMR information.
- In addition all the wearable data, pharma data, genomic data, the past claims data, because that provider is part of this block chain network we have access to this information where the validity of the data and identity is immutable and easy to access.
- The advantages of block chain enabled solution is that healthcare providers will have a greater ability to treat patients, with a better picture and understanding of the patient's health.
- It will also save in costs, today in a fixed fee based healthcare system when you run a redundant test the system makes money, in the future value based model that will not be the case and that redundant procedure will not be reimbursed, access via block chain can eliminate that redundant test and reduce cost.

Block Chain – Healthcare example

- Block chain has the potential to improve treatment.
- This is the core mission for healthcare providers, to improve quality and reduce the cost of healthcare by enabling the secure delivery of data across multiple providers and modalities.
- Improve safety by providing a more reliable identity management process and reduce the stress on patient's when communicating health information as they inherent more responsibility in their own care.

What's missing?

Enterprise Block chains need more

- How to work with existing systems
- Operations and management
- Privacy understanding
- Identity and Key Management
- Be great to have some analytics
- Tools need to improve

Questions

How can CISO's address the blockchain challenge?

“Blockchain has the potential to become a significant trust enabler in the CISO's arsenal. However, solutions are unclear, standards have yet to coalesce and regulation is far on the horizon. CISOs must make informed technology decisions that align with the organization's risk appetite and tolerance.”

Block chain is not widely adopted in any industry, not in the least in healthcare.

- So why should we sign up for an unproven technology?
- I do not discount the concept, just that when the broader market has not adopted it begs the question. Now when I wake up tomorrow & see headlines that Microsoft is using Blockchain to drive their new security software and their stock is up 25%, then that will settle my skepticism....but until then...

From my perspective we still need to firm the problems we want to solve...so I don't much worry about the solution yet.

We now have the hammer and now we are looking for a nail.



