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BLOCKCHAINS FOR INSURANCE

Reimagining the Bond of Trust

One of the world's oldest financial products and the $5tn industry that powers it may be in for change. In this CoinDesk Research report, we explore how blockchain technology is being used to enhance insurance services and products – potentially altering forever how they are accessed and delivered.

REPORT

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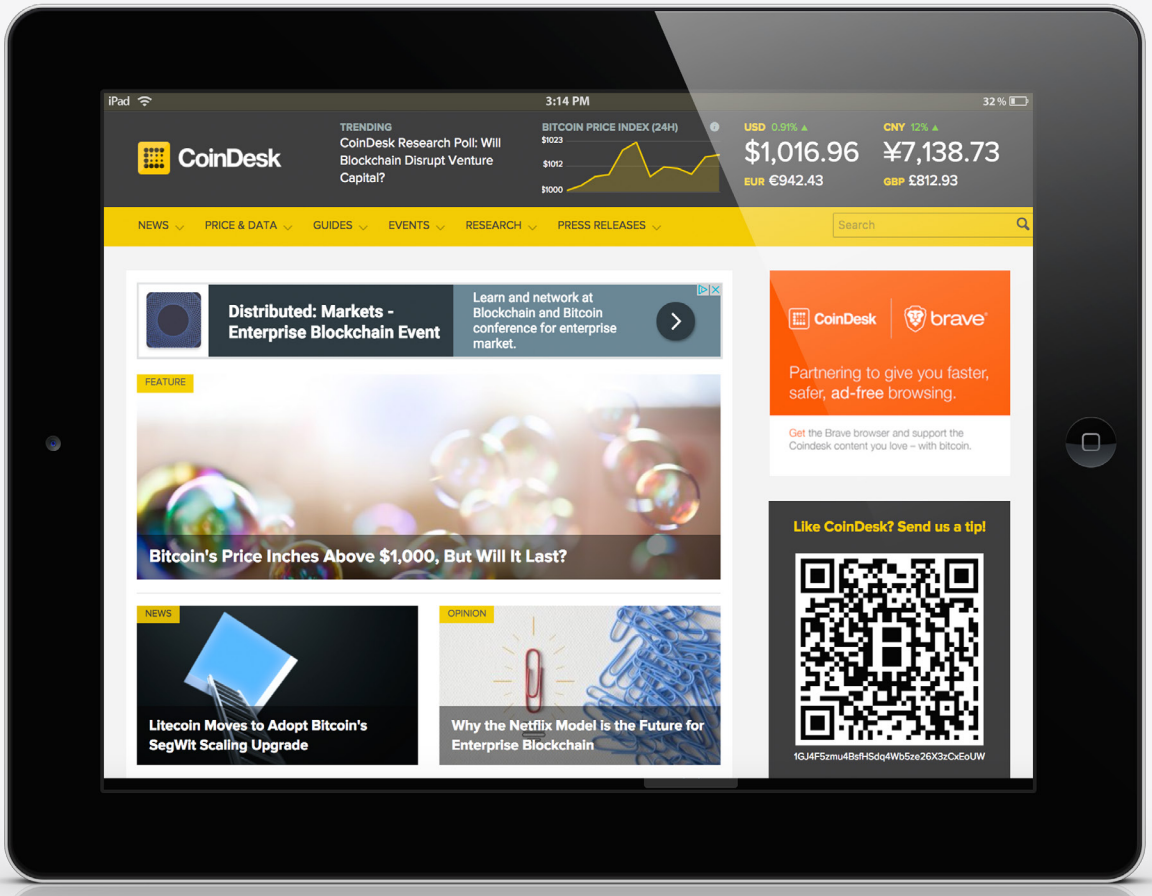
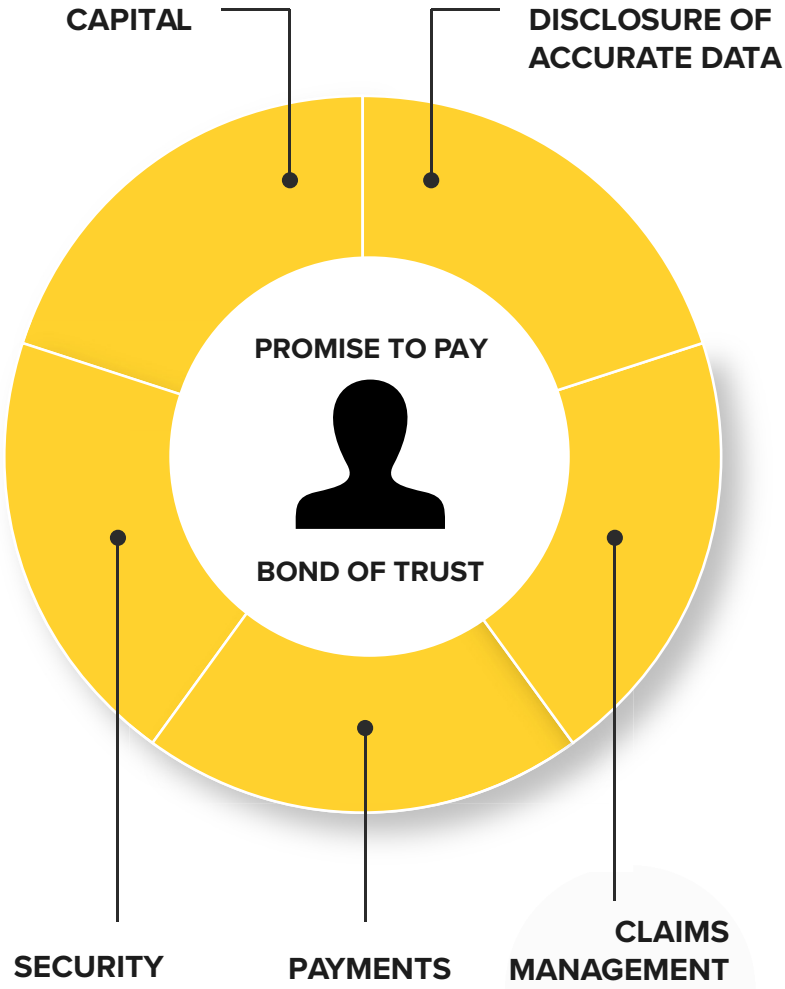


Why Blockchains for Insurance?

The insurance industry collects around $5tn a year in premiums. It touches every aspect of the global economy by covering almost any risk that can be measured.

Yet, the industry as we know it rose from an ancient and humble financial instrument — the promise to pay.

The heart of the insurance industry, promises to pay are built from bonds created from the orchestration of claims management, payments, security, capital and the disclosure of accurate data.



From this bond, trust is created, with many more useful and specific promises to pay evolving from there. Death, injury, loss and other hazards can all trigger an eventual insurance payment. Because verbal commitments can be easily made, broken or forgotten, a vast paper-based records network evolved — what we today recognize as the insurance industry.

Accountability and auditability are two tools that shaped the industry. These two tools have been used to secure relationships between all the parties involved in the insurance industry's bond of trust. This has meant measuring risk while keeping score of who owes what to whom and how good these parties are at delivering on promises made. Insurance adjusters, brokers, actuaries, underwriters, capital managers and a host of other professionals and clerical workers hold tight to deliver this bond of trust.

Trust happens to be what blockchain technology is all about.

In the case of bitcoin (and in reaction to the 2008 financial crisis), an unknown developer or developer group going by the name 'Satoshi Nakamoto' released a white paper describing how a 'chain of blocks' could be used to create digital ownership through a protocol that would decentralize authorization and authentication. The result is the unique combination of technologies and cryptography we call a 'blockchain' today.

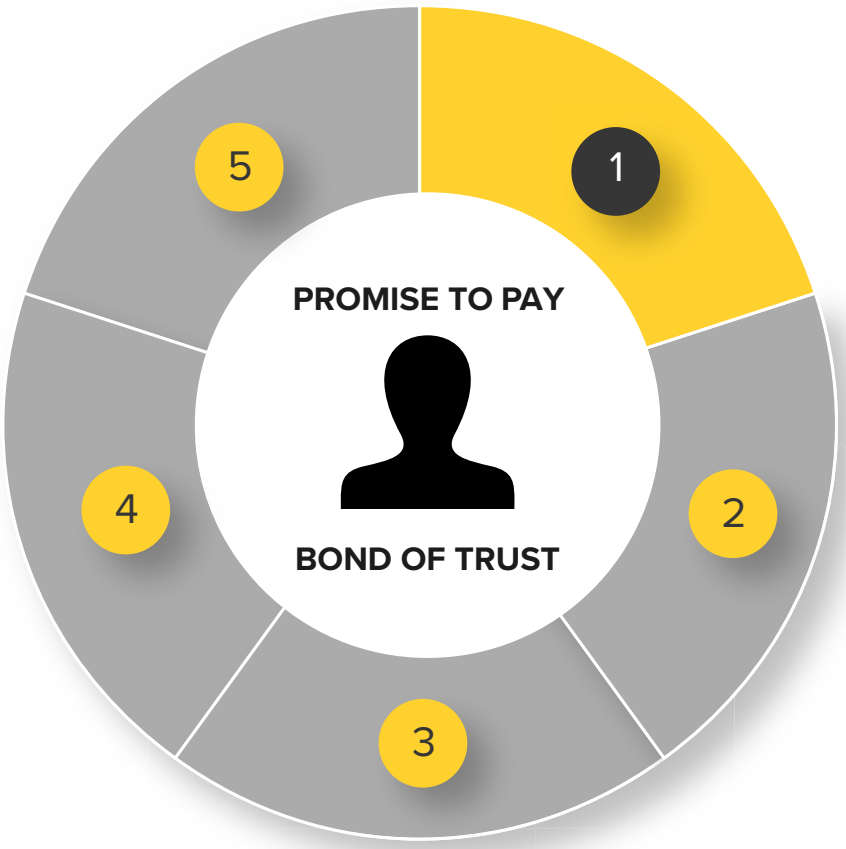
Instantly, this new technology revolutionized the way transactions were broadcast and recorded. History's first permanent, decentralized, global and trustless system of records was born. Entrepreneurs in industries around the world are rushing to create digital relationships built from these new systems of record and employing these cryptographic tools.

Digital and paper-based systems of record are how relationships in the bond of trust are secured today. But blockchains are changing how data is disclosed, claims are managed, capital is used for underwriting, and how payments are made through automating business logic. These developments create new data points, secure valuable digital interactions, and create new products and platforms that are possible with smart legal code.

These innovations hint at major change to the bond of trust that is the foundation of the insurance industry.

After all, insurance is an intangible asset. It is not a physical thing, consumers are buying a risk managed outcome. Relationships manage these outcomes. Blockchain technology is tightening and digitizing the ties that bind the trust used to sell risk managed outcomes. If the startups and incumbents are able to realize the goals discussed in this report, the relationships underlying the bonds of trust themselves may change.

For this reason, many of the over 30 companies and startups featured in this report believe there will be a revolution in the industry.



The Disclosure of Accurate Data

P&C Insurance
Today: Insurance adjusters primarily use manual and physical processes.
Blockchain: Insurance adjusters gain new cryptographically secure data points to investigate fraud.

Title Insurance
Today: Art authentications and land title searches require expensive professional services.
Blockchain: Title holders have access to new inexpensive authentication tools.

Sharing Economy
Today: Brokers sell personal and commercial insurance policies separately.
Blockchain: Brokers are sidestepped with dynamic premium offerings processed from high state of change.

Risk Modelling
Today: Actuaries provide risk data points for all of those involved in the industry.
Blockchain: Actuarial sciences are disintermediated by prediction markets.

Insurance differs from other financial services and products in an important way: while capital markets or trade finance are based on information asymmetry — an exporter doesn't share profit margins, for example — insurance demands information disclosure. Parties in the bond of trust must reveal information requested by other parties as everyone is trying to measure their exposure.

A vast network of intermediaries, professionals and administrative clerks work through this maze of bilateral relationships between participants in the bond of trust. Their work is motivated by collecting and sharing information with other participants.

Blockchain technology has often been described as a 'database innovation'. While this is true, the story is actually a little more nuanced. More than a database, blockchain technology represents an innovation to systems of record. A system of record is more than a snapshot in time. It is data with a history of itself that takes note of transactions, amendments, drafts or anything else related to the story of the data. Blockchain technology as a medium involves both static data (records) as well as dynamic data (transactions), establishing a system of record.

The immediate implications of this new system of record affect title insurance, both for valuable property and real estate. Property and Casualty (P&C) insurance is seeing new trustable data points being created and secured using the cryptographic tools inherent to blockchains. For the sharing economy, the transaction capacity of blockchain technology helps insure private property used for commercial purposes. The transaction qualities of the technology also suggest an entirely new way to measure risk, which would completely alter the bond of trust, flattening it into a simple product based on odds created by prediction markets.

Tokens Get Real

To so many people, digital means ephemeral, not real in the way that a coin or gold or even a dollar bill is real. This has been the part of the blockchain technology education curve and lots of effective outreach has been done.

But from the perspective of large companies, governments and think tanks around the world investing important resources, the consequence of this idea is just now being understood. Suddenly there exists a new digital asset class with a market cap of over $17bn, roughly the size of the economy of Iceland in 2016. This number does not count the in-house corporate investments in time and experimentation which form an important global industrial effort. The state of Delaware, where 65% of Fortune 500 companies are incorporated, is creating legal framework for digital assets, promising more growth around the corner.

But the story of blockchain tech in insurance begins with a U-turn on this evangelical push. Using the cryptography upon which blockchains are built, entrepreneurs are leveraging these new secret-keeping tools to fight insurance fraud. Using these cryptographic tools, physical items can be authenticated in the digital world.

The effect ties the physical item to the digital world. It creates a reference that ensures the physical item is the unique item it is purported to be.

Tying a physical item to a blockchain for identification using cryptographic tools could prove to be a powerful tool to fight insurance fraud.

But, how are digital tokens created? The process begins with a foundational cryptographic tool in the blockchain world: a hash. A hash can be thought of as one-way encryption, where the source message cannot be derived from the hash it produces. It's the hashes that are used to represent a physical item as a token.

Cryptographic protocols are useful in solving problems with secrecy, authentication, integrity and dishonest people. Protocols are the arrangement of tools and techniques to secure against these problems, in other words, a series of steps. The step in the protocols discussed in this section focuses on hashes.

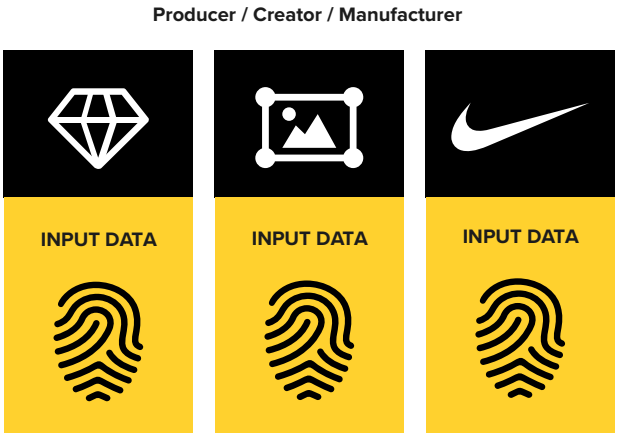
Hashes are easy to compute in one direction, and hard to compute in the other direction. However, knowing a secret allows a person to easily compute the function in the other direction.

So, a person with knowledge of a secret (a private key), can decrypt a hash and discover the original file. Hashes can be used to establish a digitally unique identity that can bridge the physical and digital world, providing a reference point to confirm physical identity. An item with a unique private key can correspond to one hash stored in a network. Startups are working on property and title insurance by tokenizing high value physical items. They are putting what are called digital fingerprints for these physical items into blockchains, there to be read at any time, forever without unnoted amendment or change, while keeping track of who has looked at them.

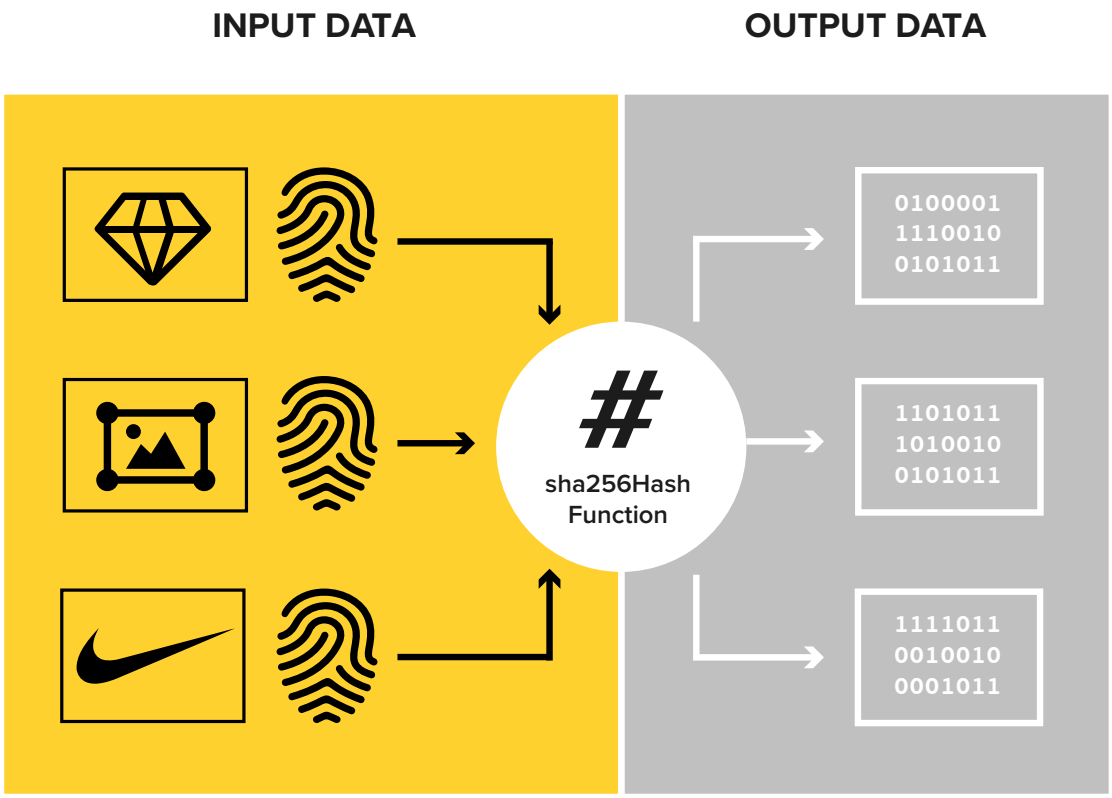
How blockchains address insurance fraud:

1. A high-value item is created and a digital fingerprint is issued by a trusted entity, which acts to authenticate its point of origin.

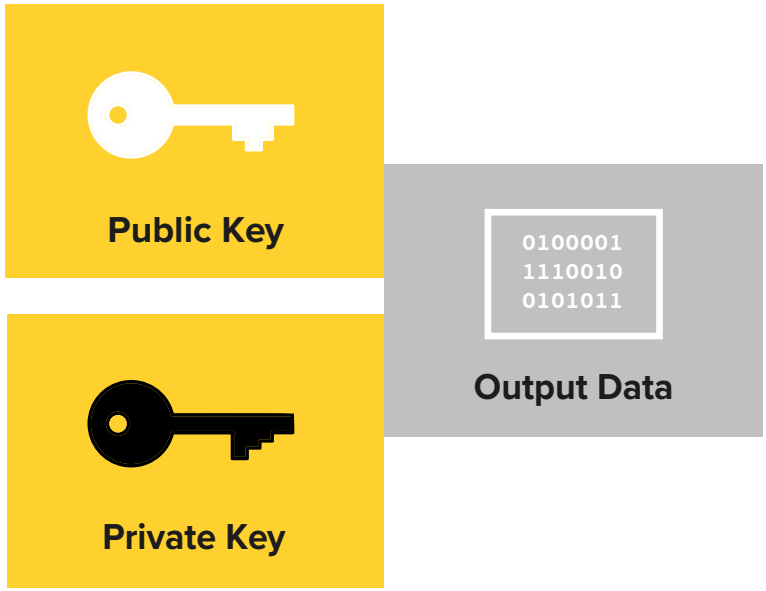
(Trusted entities could be any producer: jewel maker, artist, or manufacturer.)



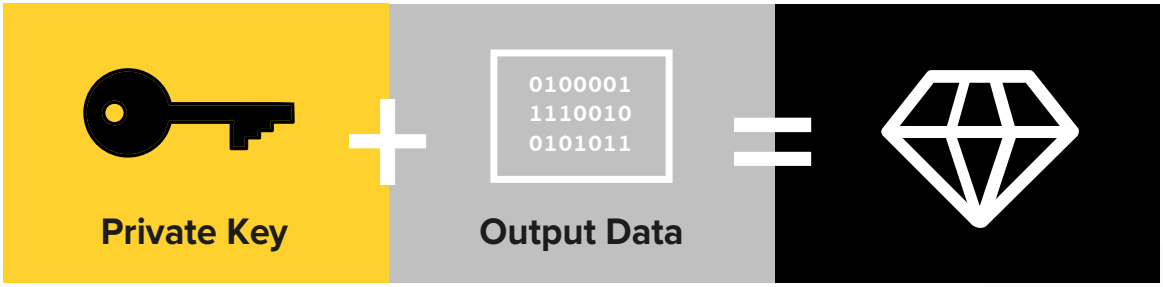
These datapoints are then encrypted using a hash.



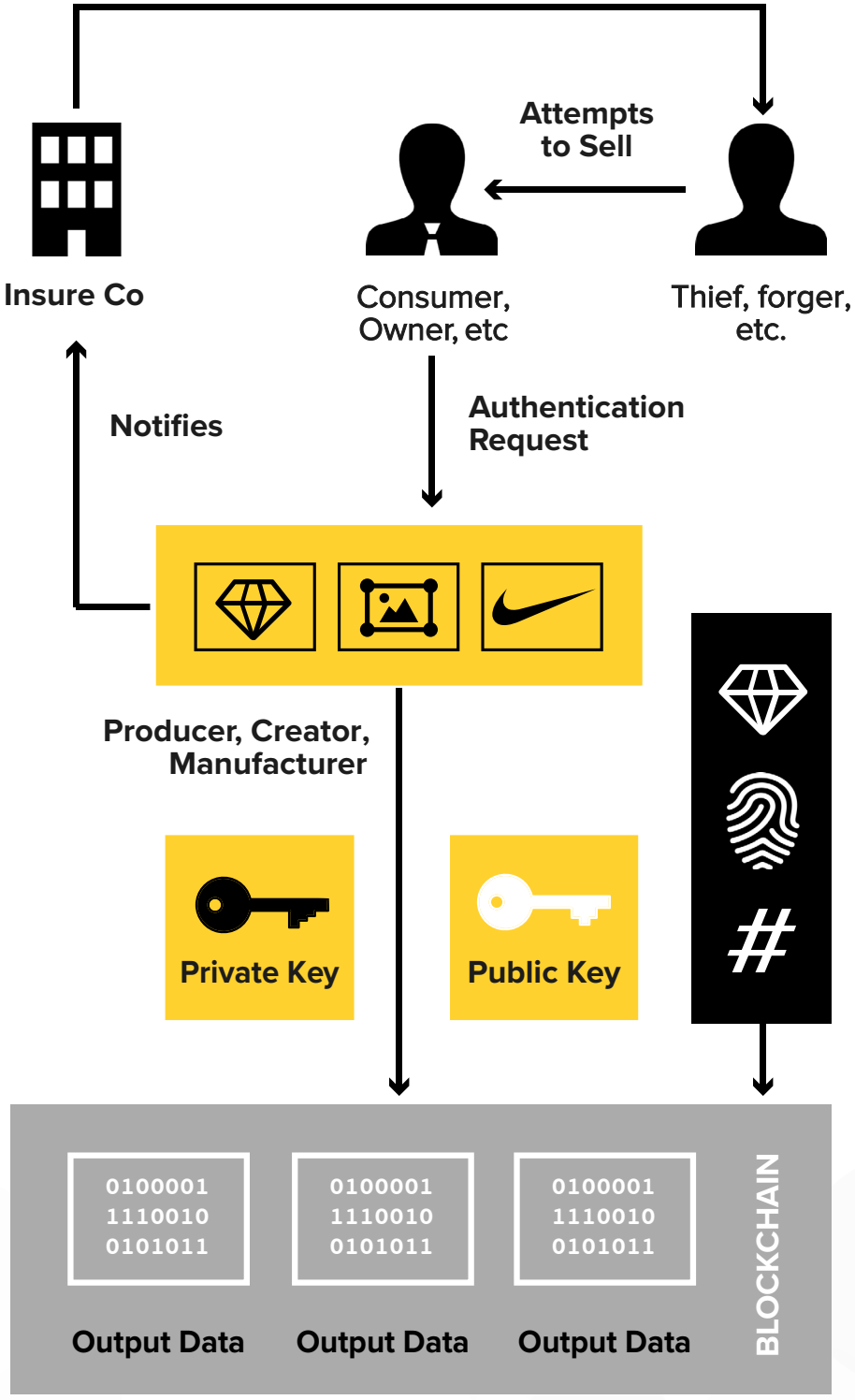
2. Hashed output combined with a public-private key pairing.



3. A high value item can then be checked against its hash through an associated private key. This has the effect of binding the physical item to the digital world for reference.



Here's a look at the full orchestration of the tech and business model:



Everledger

Everledger provides a perfect (and often-cited) illustration of how this approach works.

Everledger's founder, Leanne Kemp, has identified a blind spot in the insurance industry around high-value items. Diamonds, which Everledger focused its early stage efforts on, are often insured as part of **line-item property insurance**.

The blind spot comes from the lack of tools insurance companies have to fight against insurance fraud involving high-value items, diamonds being an example. Indeed, CoinDesk spoke to a lawyer for an unnamed insurer focused on high net-worth clients who stated that their company does not even bother investigating diamond thefts. Their policies simply pay.

> **"Fraud is becoming just a cost of doing business," Leanne Kemp said. "A certain amount of fraud is accepted."**

Fraud exists here because there is no way for the physical item insured to be identified, particularly in the case of diamonds, and combating this type of insurance fraud is where Everledger applies its cryptographic technology.

First, Everledger takes a kind of picture of 40 separate points on an individual diamond. These 40 points combine to create a digital fingerprint that, like a diamond, is unique.

Next, Everledger takes the data representing this fingerprint and hashes it into the blockchain. Each fingerprint of every individual diamond is then stored as a hash in the blockchain forever (ergo, Everledger). Everledger then provides access to its blockchain diamond fingerprint database for insurance companies so that identification of a diamond during an investigation is possible.

Kemp said:

> **"The insurers are actually the rightful owner of these diamonds. They paid the claim out and the title of that diamond ultimately sits with the insurance company. So it's actually the insurance company's property that will be recovered."**

Everledger has hashed the fingerprints of over 1 million diamonds onto the bitcoin blockchain over the past year. Diamond fingerprints are on the blockchain, while they store more sensitive data about a diamond (like a police report) on their own private blockchain built on the Eris stack. There are plans to work with the ethereum blockchain.

Just as Everledger can use a number of blockchains to perform its services, its business model can, in turn, be adapted to any use case where a shared system of record for valuable items would be beneficial.

Art

As a sign of its willingness to enter new markets, Everledger invested in Vastari in 2016, an online marketplace that connects private art collectors with museums for exhibition deals. Vastari is also a startup, it completed a funding round in January 2016 that valued the company at $2.3m.

The company's product will write information about works of art into bitcoin's blockchain, as well as their own private blockchain. Everledger's plan is to make each art institution a separate node on its blockchain so that they can be complicit in adding counterfeit security and insurance to the market.

The goal of Everledger's work with Vastari is not quite the same as its work with diamonds from an insurance perspective. Diamonds are a part of line-item insurance. For high-value items where the history of the creation of the item is important, such as with art, there is another insurance product consumers buy: **title insurance**.

Title insurance covers a buyer when an artwork is stolen before it was purchased, or is a counterfeit, rendering the title defective. In the art world, it is a niche insurance product built by expensive specialist investigators and appraisers, and premiums are increasing as high-profile art forgery cases are made public, bringing more risk for insurers.

The largest defective art title case in US history was recently uncovered, where counterfeit art was sold for $80m over a period of 15 years. The discovery led to the bankruptcy of Knoedler, the oldest and most prestigious art dealer in New York City.

As forgeries become more difficult to detect, the competition amongst the niche insurers is growing. It is within this competitive landscape that Vastari, Trace and several other businesses are seeking to operate.

Mohamad el Boudi, founder of Trace, aims to use blockchains to help art dealers and galleries keep track of their collections and protect against counterfeits. His goal is to create a certification system for artwork that allows it to be tracked from the original artist all the way to the successive sellers. This would eliminate the need for the specialized and expensive work of art forgery investigators.

Insurers would be able to use this system to offer title insurance and have an inexpensive means of tracking the authenticity of the artwork. Many of the copyright blockchain announcements that have been made are picking up on the same logic.

A proof-of-concept (PoC) by Deloitte resulted in a public announcement and press release in May, 2016. The PoC, 'ArtTracktive', was a blockchain application that could manage the interactions between the artist or the owner of the piece of art, freight forwarders, customs, art galleries, museums and all the way to potential buyers.

As such, the project offers a view of how a shared system of record for the ownership and identity of an object could involve many parties. Partner and technology leader at Deloitte, Patrick Laurent, described the approach:

> **"The blockchain distributed ledger can trace the journey of artworks. When this technology is used in the art market, all events in the lifecycle of an artwork are recorded and traceable. The application addresses one of the main concerns in the art market today, namely the fragile documentation related to the provenance and movements of a piece of art."**

If these systems reach scale, they would create a new data point whose effect could change the relationships needed for title insurance in the art industry.

Land Title Insurance

Yet, art is only one example of a larger change blockchain technology could bring to title insurance. An important use of title insurance is to protect against the financial loss incurred from defects in real estate titles (essentially, when a home is sold to a buyer, but the seller never really owned the place).

This is a significant transaction cost in the US. Because so many US counties use the land recorders system instead of a land title system, clearing up all the financial arrangements around real property can be more complicated. The registries system that most US counties use is much more of a system of record to legal rights for property, and a clear establishment of the ownership instrument at play.

This is a long, slow and labour intensive process that involves checking multiple land registries in various county-held registries.

For these reasons, the market is large. According to the Australian industry research company IBIS World, real estate title insurance is a $20bn industry globally. This size and attractiveness has led several startups to begin working in the space.

Like copyright protection and its implications for intellectual property, Chromaway, Bitfury, Factom, the International Bitcoin Real Estate Association (IBREA) and several other blockchain startups have announced plans for a land title blockchain solution. In a report published by Goldman Sachs this year, its researchers estimated that by using blockchains to record land registries, US title insurance premiums could generate $2bn-$4bn in cost savings.

If they are successful, the commercial relationships that are made to insure title of homes will use a new data point which may alter the nature of these relationships.

The Sharing Economy

The Sharing Economy is generating new revenues for people all over the world, but the rise of startups like AirBnB and Uber has also changed the way we think about consumer trust. Passengers gladly enter a stranger's car even though no licensing body permitted it to be a taxi. We trust peer reviews on the Uber app, the same goes for AirBnB.

The sharing economy brings unique challenges to insurance and the bond of trust. **Personal insurance policies do not provide coverage for private property used commercially.** There has always been a separate insurance for that (commercial insurance). This separation has resulted in a market inefficiency when it comes to insurance products available for the booming sharing economy.

The products don't exist because insurance is a paper-based business based on annual contracts (annuities). This involves recording the quality of what is being insured, which is a long and slow process. For example, if Uber drivers needed to reach a human employee who could record the quality of the insured vehicle from a car to a taxi to a car to a taxi, it would be hideously expensive and time consuming.

This current situation is unsustainable. The sharing economy, which is an all-of-a-sudden $335bn market, needs adequate protection for commercial activities utilizing personal assets.

What this new market has used until now for coverage are umbrella offerings from the platform itself, like AirBnB's Host Protection Insurance product. But these umbrella offerings bring about a certain exposure to AirBnB and Uber. Both of these companies are seeking to diversify their insurance offerings. Other startups working in the sharing economy do not want to have this exposure to risk. They want to find an insurance offering they can use so they can focus on building their actual sharing network.

In short, there is a market opportunity for an insurance product that allows for **dynamic premium adjustments.** That is, a product that insures how property is being used, and in what conditions and at specifically what time.

Insurance brokers trying to keep up with changes of an Uber driver.

SafeShare Global, Vrumi, Z/Yen and Lloyd's of London

SafeShare Global is a startup looking to fill this market gap in insurance products tailored for the sharing economy. For one particular new product, the company has partnered with another startup, Vrumi, to create the first blockchain insurance solution for this growing sector.

London-based Vrumi is a network that connects professionals who need work space with individuals who have rooms to spare in private homes. Basically, a person leaves their home and goes to work while someone else arrives and works from that person's home.

Unlike AirBnB, Vrumi chose to avoid developing an umbrella insurance offering with its attendant risk. Instead, it started a partnership with SafeShare Global.

SafeShare's technology comes from Z/Yen Group, a London-based commercial think tank, venture firm and consultancy with a long history with ideas similar to blockchain technology. Its founder, Michael Mainelli, has a bright and active mind. So bright and active, in fact, that it turns out that for the last 20 years, he and Z/Yen have been building something akin to permissioned, cryptocurrency-less blockchains.

Mainelli, who has built over 200 cryptographic shared ledger systems, described the relationship of Z/Yen's approach and bitcoin's blockchain:

> **"It's not a consensus system. It's woven broadcasting. There's no mining, but you get what you want: an irrefutable evidence trail."**

Z/Yen arrived at blockchains through a guiding philosophical focus: to answer the larger question, "When would we know our financial system is working?" The commercial think tank started in the 1990s, giving it a head start and allowing Z/Yen to embrace the blockchain revolution at full speed. They have already developed several interesting projects that span multiple partnerships within the insurance industry.

Z/Yen's work with SafeShare involves a timestamp. No centralized authority can manipulate how the timestamps are authorized, creating an automated network able to handle the state change recording and broadcasting required to power insurance for the sharing economy. So, SafeShare, Vrumi and their customers can track when a home is a home and when it is an office and what insurance premiums apply when. The timestamp is already in commercial use.

Lloyd's of London, an insurance market of brokers and underwriters, has found this timestamp credible enough to offer to underwrite insurance contracts using it. Using SafeShare's timestamp, Lloyd's 24-hour opt-in underwriting contracts are enabled.

Mainelli explained Z/Yen's partnership with SafeShare and what the implications for the future of the insurance industry may be:

> **"The instantaneous speed of verification for coverage via a distributed ledger will allow insurance to be obtained on an ad-hoc basis by the user, rather than having the liability solely with the service provider," he said. "Removing the need for funds to be transferred through a network of payments will likely decrease frictional costs and ultimately reduce the price of coverage."**

The ad-hoc basis is what is so disruptive, as much of the industry is based on annuities or annual payments. The entire client-broker relationship revolved around the ceremony of signing the annual coverage contract. By eliminating the business practice of purchasing insurance on a yearly basis, the relationship between the insurer and insured is being rewritten, allowing for dynamic premium adjustments based on more specific circumstances and slices of time.

Risk Modeling

More disruptive than providing a single new data point, what entrepreneurs aim to do with blockchains in risk modeling is something totally new. Risk modeling is where the most important data points for underwriters are generated. This is how underwriters understand what they are signing to cover, and this is where the money for the promise to pay is coming from.

The models currently used are built by actuarial scientists. But, the use of blockchain technology for prediction markets may change the relationship between risk modeling and underwriting, completely flattening the bond of trust into a simple marketplace.

Prediction Markets

While this report will look closer at Bloq, one of the more interesting startups in the blockchain world, Bloq's chief economist, coder and statistician Paul Sztorc, has been prolific at sharing his insights about the potential for predictions markets. He spends more time commenting on prediction markets on YouTube and in writing than anyone in the world.

His own explanation of prediction markets is a helpful description of how they work:

> **"Individuals might 'bet' on natural disaster, death of an essential leader, election of a ridiculous leader, industry-killing technological innovations, crippling regulatory activities, pandemic, disruptive weather or other harmful events. Many corporate boards have already signed legal commitments to reduce/hedge the above risks to the greatest extent of their ability. Any hedging would thicken the market and draw in profit-seeking speculators, who would produce actuarially fair prices as they competed against each other."**

His work suggests something larger than just a disruption of a facet of the insurance industry like the disclosure of accurate data. What Sztorc is saying is that prediction markets become the insurance industry. In other words, prediction markets are in and of themselves made up of insurance-like contracts. This wouldn't merely replace actuarial sciences as a data point, it would alter how the industry interacts with the insured in the market.

Sztorc said that "prediction markets themselves create the insurance product." What that means in the context of this report is that the bond of trust that makes up the insurance industry would be flattened. The pentagon of participants in the bond of trust would no longer exist or need to exist, as the prediction marketplace would deliver an efficient product that protected consumers according to their specific needs.

Sztorc is also realistic about the true limits of such a revolution: "People do not like the accuracy this information can communicate." The hurdles to such a change happening to the insurance industry are not limited to technology. And, for change to happen, millions of users would need to be involved in the market for it to reach a useful scale.

As difficult as that seems, one ethereum application is already showing signs that prediction markets could be built to this scale.

Augur

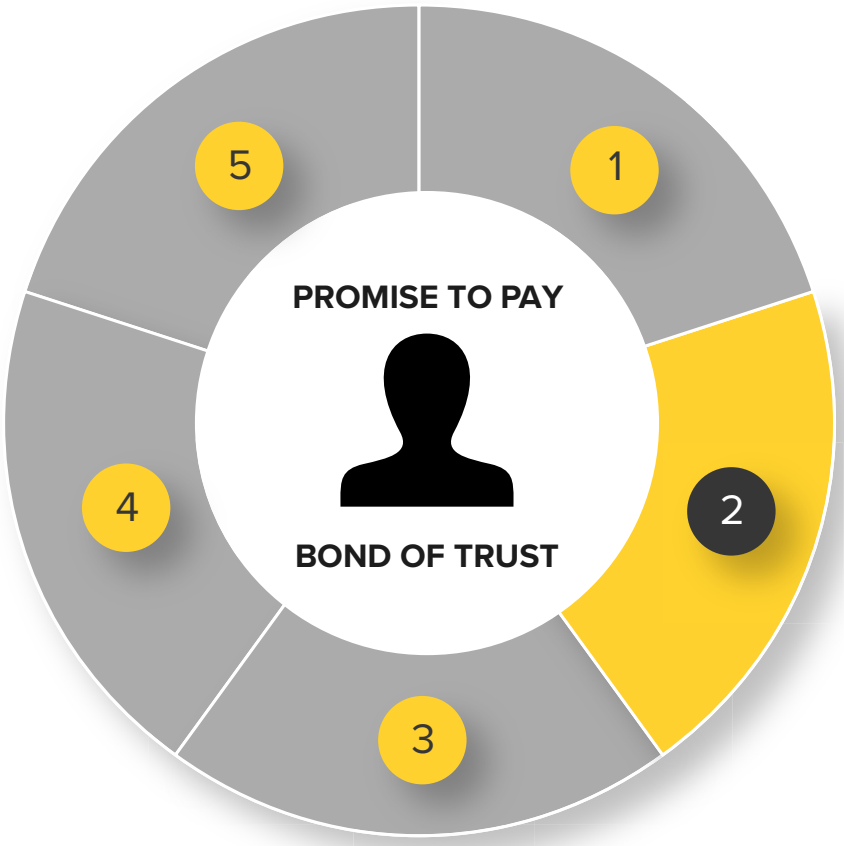
Augur is a prediction market platform that rewards a user for correctly predicting future events by allowing them to purchase and sell shares in the outcome of these events. Essentially, people can bet on what outcomes they think are likely or unlikely.

While still in the development phase on ethereum, Augur is open for use and testing. The startup has already generated a lot of buzz and made some history, raising a $5m crowdfund sale over 45 days in the summer of 2015. Tradable tokens issued from the crowdfund aim at both spurring adoption and to provide a mechanism for supporting the project.

The tokens also represent the currency needed for the predictions marketplace. Augur's goal is to create markets where questions are asked and the odds and risk of outcome are measured by the price of a share. This is the same question actuaries are trying to answer.

The difference is that instead of actuaries, Augur employs the wisdom of the crowd to arrive at their predictive result.

The goal is for users to be able to Google events that haven't happened yet to get an estimate of the likelihood of that event happening. The implications for insurance is that underwriters and actuarial scientists would cease to be needed to deliver anything to the bond of trust.



Claims Management

P&C and Health Insurance
Today: Claims processors manually track the logistics of paper documents, authenticate users, and authorize transactions.
Blockchain: Claims processors use blockchain platforms to eliminate data entry duplication and simplify communications and coordination.

Wholesale Insurance
Today: Bespoke insurance products involve complex agreements between the insured and many specialized parties.
Blockchain: Shared systems of record simplify the cost to create and coordinate bespoke and specialized insurance products.