



# BLOCKCHAIN HEALTHCARE 2016

Promise & Pitfalls



TIERION

# Introduction

There's a lot of hype around blockchain. In 2015, Tierion was the first company to complete a blockchain healthcare project by becoming the first partner in Philips Blockchain Lab. To separate the hype from the reality, we're sharing our perspective after a year of working with the world's largest healthcare and insurance companies. Many reports on blockchain portray overly optimistic scenarios. We aim to provide a balanced perspective that addresses the opportunities and risks for the use of blockchain in healthcare.

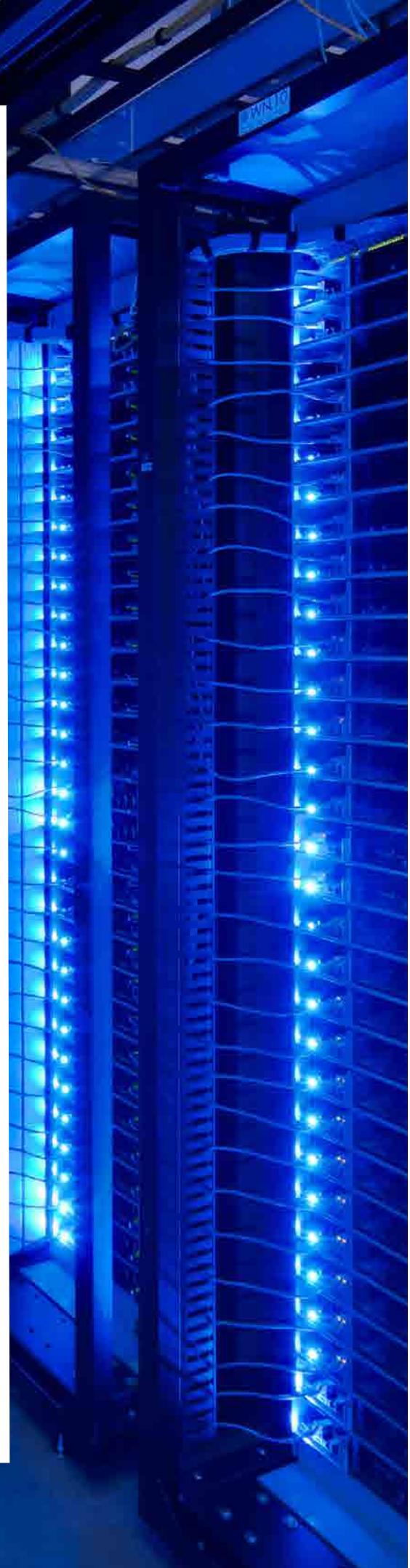
## What is Blockchain?

Blockchain started with Bitcoin in 2009. Bitcoin was designed as a global network for routing value without trusted intermediaries. Blockchain is a term used to describe systems that borrow technology and design patterns from Bitcoin. Key characteristics include no central point of control, high availability, strong data integrity, and network-wide consensus.

**“...the term ‘blockchain’ has been so misappropriated that no one knows what it means anymore.”**

**- Elaine Ou, Bloomberg**

There is a fierce technical debate over the definition of blockchain. For those making strategic technology decisions, the details of this debate may not matter. Companies will continue to market a broad range of technologies that carry the blockchain label regardless of the outcome.



## Promise & Pitfalls of Blockchain Healthcare 2016

Most blockchain technology is not ready for mainstream deployment. Financial services companies have produced hundreds of proof-of-concepts. Most of these projects have not evolved into production ready software due to technical and regulatory challenges. Experimentation continues and activity is starting to accelerate in the healthcare and insurance sectors.

| Promises                  |  |
|---------------------------|--|
| Data Integrity & Security | <ul style="list-style-type: none"><li>• Improve the security and management of patient data.</li><li>• Higher quality clinical trial data.</li><li>• Reduce regulatory &amp; compliance costs.</li></ul> |
| New Standards             | <ul style="list-style-type: none"><li>• Opportunity to establish new standards and practices.</li><li>• Optimize interactions between healthcare and insurance companies.</li></ul>                      |
| Disruption                | <ul style="list-style-type: none"><li>• Mid-sized companies and startups have the opportunity to form consortiums and disrupt incumbents.</li></ul>  |

| Pitfalls                |  |
|-------------------------|--|
| Vendor Lock-in          | <ul style="list-style-type: none"><li>• Blockchain vendors want customers locked into their platform.</li><li>• High switching costs give vendors control and pricing power.</li><li>• Risk building new data silos where customers rent access from vendors.</li></ul>  |
| Hype Overload           | <ul style="list-style-type: none"><li>• Analysts and professional experts are issuing overly optimistic reports in an effort to make their mark on the industry.</li><li>• Betting on technology before it's ready is a fast way to lose your job.</li><li>• Tokenized platforms such as Ethereum have an incentive to hype the technology to increase the value of the token.</li></ul> |
| Immature Infrastructure | <ul style="list-style-type: none"><li>• Most blockchain technology is experimental and untested.</li><li>• Greater security risk and higher development costs.</li><li>• Use blockchain to enhance secure cloud based architectures.</li></ul>   |
| Patient-Controlled Data | <ul style="list-style-type: none"><li>• Enabling patients to manage their health care data is risky.</li><li>• Deploying wallets creates a large key management problem.</li></ul>   |

# Promise of Blockchain Technology in Health Care 2016

## Data Integrity & Security

The volume of patient data managed by hospitals, doctors, and insurance companies increases each year.

- Electronic Health Records
- Health Information Exchanges
- Data collected from monitoring systems and IoT devices
- Medical insurance claims

How can organizations securely share information and allow each party verify the data is correct? A hallmark of blockchain systems is strong data integrity. Once information is recorded on the blockchain and confirmed by nodes on the network, it is nearly impossible to modify or erase.

There are two primary approaches to using blockchain to securely record and share data. The first is to build a private blockchain system among a trusted set of parties. It's not yet clear if this approach offers advantages over systems that use a distributed database.

The second is to anchor data to the public blockchain network. This generates a proof that can be used to verify the integrity and timestamp of any data, file, or business process. Anyone with this proof can use open source tools to independently verify the data without relying on a trusted third-party. This seemingly minor technological advance could have far reaching implications for the healthcare industry.

- Verify the integrity of patient health data shared between organizations
- Create immutable audit trails for health care business processes
- Prove the integrity of data collected in clinical trials
- Reduce the cost of audits and regulatory compliance

Technology to monitor the integrity of systems is sometimes marketed as blockchain technology but this predates Bitcoin by decades. The key differentiation is that new advances enable data integrity and verification on a global scale.

## New Standards

Interest in blockchain technology brings the opportunity to improve standards for managing healthcare records, insurance claims, and patient data. R3Cev is a consortium of 45 member banks that researches and develops the usage of blockchain technology in the financial sector. A similar consortium could be formed by large health care and insurance companies. Additionally, organizations such as the Council for Affordable Quality Health (CAQH) can start analyzing blockchain technology and make recommendations on its usage.

## Disruption

Modernization of infrastructure creates the opportunity for smaller players to disrupt incumbents. Interest in blockchain may encourage smaller players to create networks and compete in new ways. These networks don't necessarily need to use blockchain technology. Interest in blockchain combined with secure cloud computing technology may be sufficient to have a meaningful impact.

## Pitfalls of Blockchain Technology in Healthcare 2016

### Vendor Lock-in

Blockchain vendors want customers locked into their platform. The network effect of getting many companies on their platform increases switching costs. This gives vendors control of customer data and the ability to raise prices. This is an unacceptable scenario for many companies.

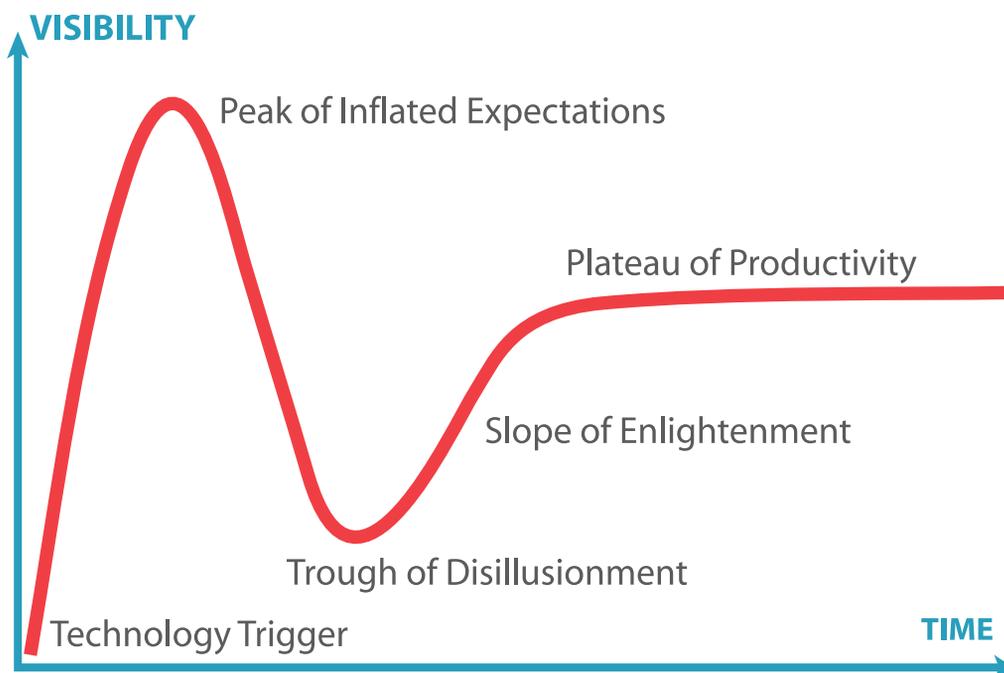
Companies promoting blockchain platforms know that once an application is built with their software, the cost of moving to another platform is prohibitively high. It may be best to wait for established software vendors to integrate new technology than to try and build something from scratch.

### Hype Overload

Analysts and professional experts are issuing overly optimistic reports in an effort to make their mark on the industry. There's little penalty for them to be wrong about predicting the future. The consequences for those making strategic technology decisions can be disastrous.

Betting on technology before it's ready is a quick way to lose your job. Before making any commitment, ask hard questions and compare new technology to existing solutions. Start small and scale up once something has demonstrated value.

Tokenized platforms such as Ethereum have an incentive to hype their technology to increase the value of the token. This risk hasn't existed with prior generations of technology. Blockchain hype has led to misinformation and widespread misunderstanding. This is an important factor to consider when evaluating vendors.



Blockchain in healthcare is rapidly ascending to the "Peak of Inflated Expectations"

## Pitfalls of Blockchain Technology in Healthcare 2016

### Immature Infrastructure

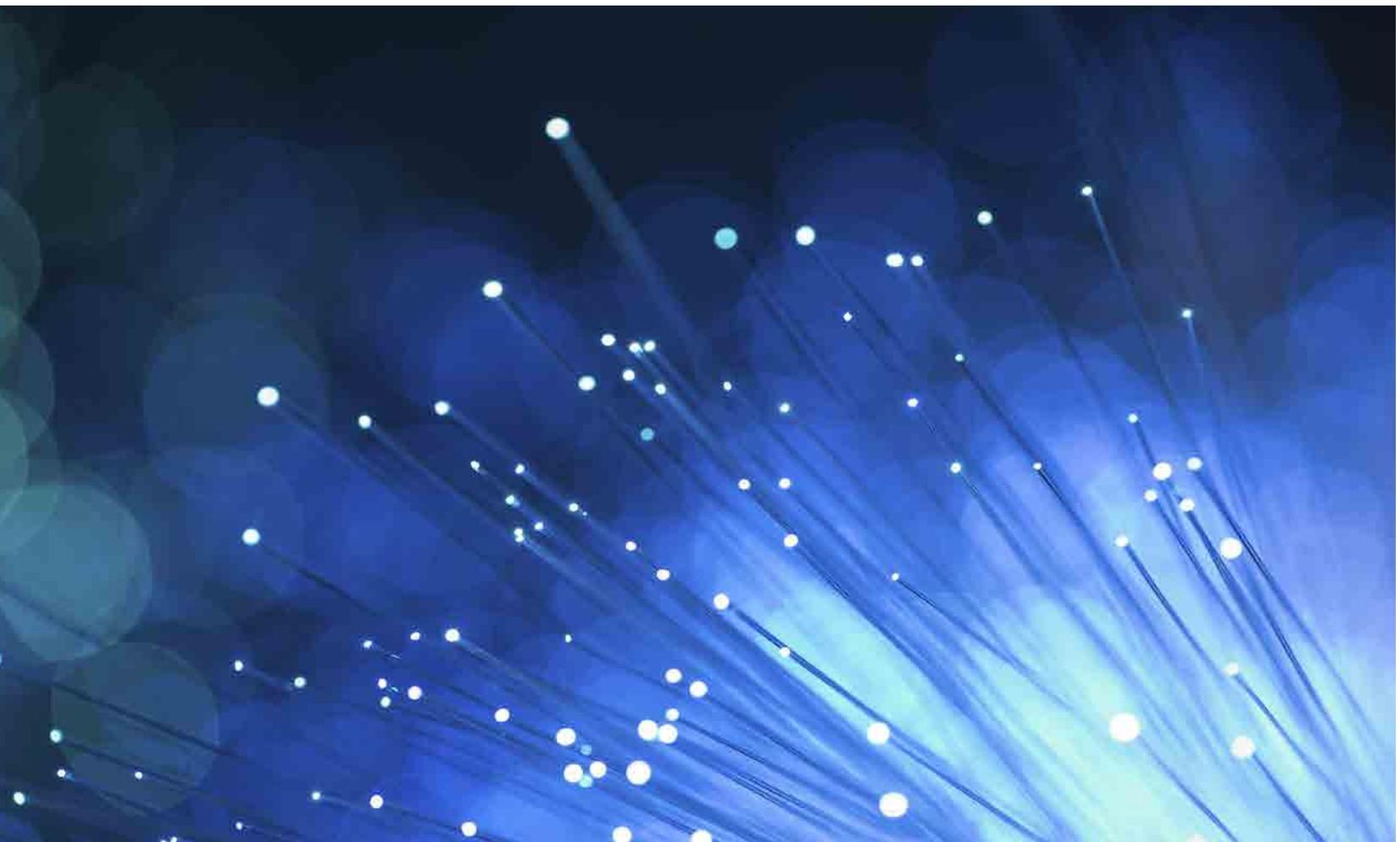
Healthcare technology moves slowly, in part because of the high consequences of failure. People can die. Healthcare data is a prime target for hackers. Cybercriminals sell medical records on the dark web for \$20 compared to \$1 per credit card number. These pressures increase the need for companies to use proven technology.

Most blockchain technology is less than two years old and has not been tested in a production environment. Smart contracts, blockchain identity, decentralized systems, and other popular buzzwords are in a very early stage of development.

Developers with blockchain expertise are rare. Blockchain developer tools are nascent. These factors increase security risks and make the cost of developing with blockchain platforms higher than existing technology stacks.

Public blockchain platforms are constantly attacked and subject to security exploits. For example, in Q3 2016, Ethereum suffered two attacks that shut down a large percentage of nodes. An exploit in a smart contract resulted in the loss of \$60 million USD. A political decision to rectify this exploit led to a network fork. There are now two competing versions of Ethereum. The risks of building mission critical applications on unstable infrastructure is significant. Over time, countermeasures to attacks may harden the security and resilience of blockchain networks.

Many companies will choose to wait for mainstream providers to integrate blockchain technology with their products instead of taking a risk on a new vendor.



## Pitfalls of Blockchain Technology in Healthcare 2016

### Patient Controlled Data

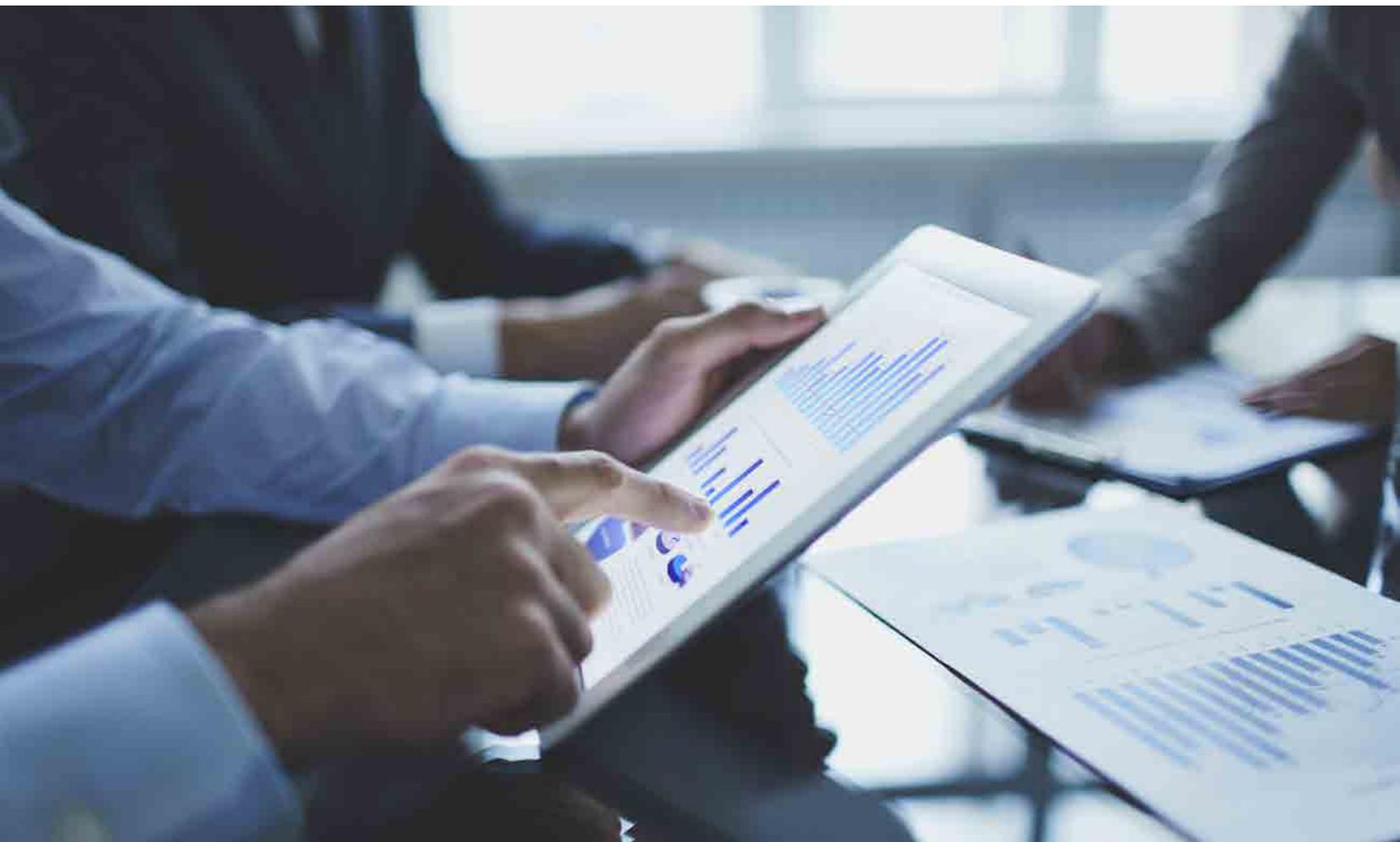
Giving patients control of their health records sounds like a good idea, but it comes with significant risks. If a patient is incapacitated, emergency workers need to gain access to health records without the patient's permission. This necessitates an alternative access method is built into the technology that safeguards the data. This backdoor represents a security risk.

Blockchain systems use wallets and private keys to control access to information. In some scenarios, multiple parties must sign a transaction for it to be valid. This means that a third-party will have access to patient data, which is no different than current models. Broad deployment of blockchain healthcare technology would likely result in the world's largest key management problem.

There is a significant cost and risk in deploying wallets and training consumers on their proper use. Usability problems and user errors could increase the likelihood that patient data is stolen or lost. Consumer Bitcoin wallet companies have struggled with usability issues for years. Managing access to healthcare data is more complicated than managing payments. It's likely that the risk of errors would be even higher than the already high error rate of Bitcoin wallets.

### Conclusion

Blockchain presents more pitfalls than promises at this early stage. We're optimistic about the impact of blockchain in the years to come, but sober about the reality of what is possible today.



Tierion is the world's first proof engine. Our technology turns the blockchain into a global platform for verifying any data, file, or business process. Use Tierion's API and tools to anchor a permanent, time-stamped record of your data in the blockchain.

<http://Tierion.com>

