Blockchains:
Moving Digital Government Forward in the States

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Scan any business, technical, or financial media source today and you are sure to find an article on blockchains. Blockchains have emerged as one of the next big transformational technologies. However, blockchains are more than technology and how transactions will be executed and the potential impact on the economy is enormous. It's still early in state government, but with the potential in the public sector, NASCIO will be exploring blockchains in the coming months. We won't delve into the mechanics of blockchains, nor the potential for proliferation of new "e-currencies." NASCIO will open the door to the world of blockchains through a variety of conversations with leaders in state government and industry in order to begin discussions regarding where blockchain technology can serve the mission of state government.

Survey Results

To begin the discussion, NASCIO issued a one question survey to state CIOs. The results are as follows:

To what extent is blockchain technology and economics on your agenda?

19 out of 19 people answered this question

1	Still investigating blockchains in state government with informal discussions	12/63%
2	No Discussion of blockchains at this time	5/26%
3	Adopted blockchain technology in support of some state government services	1/5%
4	Formal discussions on blockchains	1/5%
5	Blockchain technology is referenced in the state enterprise architecture and/or IT str...	0/0%
6	Developed a blockchain road map to guide adoption and deployment	0/0%

Most CIOs are investigating blockchain technology and the application of this technology through *informal discussions*. A minority of state CIOs *are not* evaluating blockchains at this time. There are very few early adopters that see blockchain technology as a transformative technology and have formal business and technology plans for moving forward.

Key Question

Do we really understand blockchain and its applicability for our organization?"

Enterprise Relevance – The New Government Services Model

Why such energy and interest around blockchains? Blockchains have the potential for opening up new markets; for allowing any participant to enter into business whether they have a lot of capital or very little capital. Blockchains open up the global economy to everyone from large communities down to small rural communities.

Blockchain technology fits into the enterprise as a new and growing capability for creating, recording, and verifying transactions instantaneously using a decentralized autonomous logic. There is no central authority or third party required to authorize, verify, approve a transaction. The application of this technology ranges from creating whole new markets for buying and selling to real time executable contracts to managing the long chain of custody transactions in supply chains.

In essence, Blockchain is a shared, global, incorruptible and therefore trusted ledger of economic transactions. It is controlled equally by all who wish to participate and transparent, yet private. Think of it as a steadily-growing spreadsheet of records or "blocks" that create an immutable record where each block is "chained" or linked to the previous block using state-of-the-art cryptography. Each entry recorded is validated and reconciled by all participants in the network to ensure its consistent integrity.

Blockchain technology can be programmed to record not just financial transactions, but nearly anything that holds value and can be expressed in code. Anything from birth, death and marriage licenses, to property deeds and titles of ownership, educational certificates, financial accounts, medical procedures, insurance claims, to votes, the possibilities are truly limitless. Blockchain re-writes trust as we know it, replacing it with a platform of shared, verifiable integrity.

Modernizing Governance for a Distributed Economy

Effective governance in a distributed economy will require legislative agility beyond what rules and regulations can provide. Modern governance will need to carefully balance a combination of broad policy principles, technology standards and "code".

Government's Role

One of the main potential features of blockchain is to completely *disintermediate* transactions. In the case of Bitcoin, there is no central bank to manage the currency. The governance model uses consensus. A lot of the government use cases being evaluated are based on things that governments do today that involve government as the trusted holder of an official record, like a property deed. However, there is the potential that a blockchain could replace a state or local government agency role as the *keeper of truth* for some records.

Key Question

Property records provide one example. In this case, the purchaser of property wouldn't file a deed at the courthouse. Instead, they would commit the updated deed to a blockchain. If enough participants in the blockchain were at consensus that this constituted a valid transaction, then a sale of property and transfer of ownership would be transacted and recorded. Likewise, an interested party wouldn't need to look up a deed at the courthouse in this scenario. They would simply check the blockchain in real time.

All of this said, it remains to be seen if public officials and citizens will have enough confidence in such a circumstance. Will a state be the creator and administrator of the blockchain (see State of Illinois initiative described below)? This circumstance may provide a higher level of assurance for citizens. Government has historically been in the role of a trusted administrator. Citizens may not feel confident about transactions such as property transference without that trusted administrator somehow involved.

Potential Use Cases for State Government

Some of the potential areas where blockchain technology can assist with transactions, creating a necessary audit trail, authorizing a decision, authenticating authority, establishing a system of record include:[1]

- Property - encode and confirm/transfer of property

- Financial - transfer of currency, stock, private equity, bonds, derivatives; facilitate crowdfunding

- Public Records - managing the lineage of land titles, vehicle registries, business licenses, passports, voter IDs, death certificates, proof of insurance

- Private Records - managing and executing contracts, signatures, wills, trusts, escrows

- Physical Asset Keys - managing access to home, hotel rooms, rental cars, private car

State government applications:[2]

• Managing Property Deeds	• Authenticating Academic Credentials
• Submitting Healthcare Providers Reimbursement	• Filing and Managing Insurance Claims
• Evaluating and Managing Professional Licenses	• Tax Calculations and Payment
• Administering Tickets, Fines, Citations including Payments and Processing	• Managing, Updating and Transmitting Criminal Records
• Managing Birth and Death Certificates	• Managing, Updating and Transmitting Healthcare Records
• Managing micro-grid transactions in the energy sector	• Recording and reporting financial transactions, financial statements
• Managing lineage of patents, trademarks, reservations, domain names	• Managing Voting in Elections

Integrating Services for a Highly Efficient Government

A "hyperconnected" government enables unprecedented transparency, and efficiency, where services are tailored to individual's needs. Blockchain and DLT will be used to connect disparate entities within and across regional, municipal, and state entities around citizens, businesses and assets.

Government's Role

Early applications of blockchain technology are circumstances involving audit; audit trail; necessary record of information lineage; multiple systems or databases that must be reconciled due to recording errors; managing physical or digital assets; managing ownership; managing contracts or agreements involving many secondary parties.

As blockchain technology is employed in these and other ways, business processes, training and expertise, even business language will change. Similar to how cloud services, analytics, geospatial capabilities, and other transformational capabilities have entered government and industry and have changed the approach to decision making, blockchain economics and technology will impact normal business vernacular and thinking. However, this will take some time. It will be evolutionary in terms of adoption and maturity.
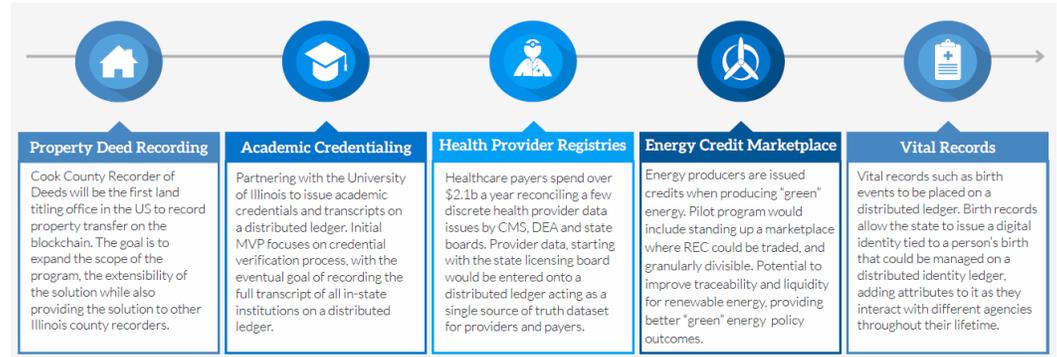
Key Question

Where could a blockchain fundamentally change a business process?

Blockchain Technology has Great Potential for State Government

NASCIO believes blockchain technology and economics have huge potential. Much of what has been presented about blockchains *is* theoretically possible. However, given the computing power available today, some of the expectations are simply not possible. There is neither capacity, nor the capability to fulfill the most far reaching and optimistic expectations we've all read about. Some proponents of blockchains offer that the technology can prevent fraud in the delivering of social services. But how is that possible given the targeted communities of these social services? Even with the transfer of value in some blockchains in existence today, and relatively limited network, validation can take a long time. As the network grows, so do storage requirements and latency in validation. Expect these issues to be solved in time.

Property Deed Recording	Academic Credentialing	Health Provider Registries	Energy Credit Marketplace	Vital Records
Cook County Recorder of Deeds will be the first land titling office in the US to record property transfer on the blockchain. The goal is to expand the scope of the program, the extensibility of the solution while also providing the solution to other Illinois county recorders.	Partnering with the University of Illinois to issue academic credentials and transcripts on a distributed ledger. Initial MVP focuses on credential verification process, with the eventual goal of recording the full transcript of all in-state institutions on a distributed ledger.	Healthcare payers spend over $2.1b a year reconciling a few discrete health provider data issues by CMS, DEA and state boards. Provider data, starting with the state licensing board would be entered onto a distributed ledger acting as a single source of truth dataset for providers and payers.	Energy producers are issued credits when producing "green" energy. Pilot program would include standing up a marketplace where REC could be traded, and granularly divisible. Potential to improve traceability and liquidity for renewable energy, providing better "green" energy policy outcomes.	Vital records such as birth events to be placed on a distributed ledger. Birth records allow the state to issue a digital identity tied to a person's birth that could be managed on a distributed identity ledger, adding attributes to it as they interact with different agencies throughout their lifetime.

Integrating Government: Pilots

Blockchain technology can be applied to numerous government services and supply chains. But do you really want to? For example, some proponents have recommended blockchain technology for managing grants. That application is probably *not* a good choice. One reason is that many, if not most, applicants for grants are already challenged regarding technology investment and capabilities. They simply could not participate in a blockchain.

States should focus early efforts on a *permissioned network*. This is a private blockchain where only a restricted set of users have the rights to validate the transactions. Then decisions regarding data and network size can be controlled through *governance. Permissionless* or unrestricted blockchains require immense computing power which is not there today. Permissionless blockchains also have a limited scalability.

Permissioned blockchains require knowing the participants, knowing your constituents, and knowing your customers. Scalability is much more feasible in this scenario.

Blockchain and distributed ledger technology will transform the delivery of public and private services, redefine the relationship between government and the citizen in terms of data sharing, transparency and trust, and fundamentally improve the delivery of government services.

State of Illinois

The State of Illinois Blockchain Initiative

The State of Illinois has focused on carefully crafting the appropriate role for government in the evolution and effective utilization of blockchain technology. That includes three stated goals; Modernizing Governance for a Distributed Economy, Developing an Ecosystem for Growth and Collaboration, and Integrating Services for a Highly Efficient Government

- *Modernizing Governance for a Distributed Economy* – Effective governance in a distributed economy will require legislative agility beyond what rules and regulations can provide. Modern governance will need to carefully balance a combination of broad policy principles, technology standards and "code".

- *Developing an Ecosystem for Growth and Collaboration* – Although, the long-term benefits of blockchain for industries, the economy and society are clear, blockchains and distributed ledger technology (DLTs) are still very much nascent technology. Governments can play a role in catalyzing its maturity as a technology by supporting grassroots developer innovation.

Developing an Ecosystem For Growth and Collaboration

Although, the long-term benefits of blockchain for industries, the economy and society are clear, blockchain and DLT is still very much a nascent technology. Governments can play an important role in catalyzing its development by supporting grassroots innovation.

Government's Role

- *Integrating Services for a Highly Efficient Government* - A "hyper-connected" government enables unprecedented transparency, and efficiency, where services are tailored to individual's needs. Blockchain and DLT will be used to connect disparate entities within and across regional, municipal, and state entities around citizens, businesses and assets.

**Key
Question**

Do we really understand
blockchain & its applicability for
our organization?

Where do I obtain expert
consultancy?

The State of Illinois is a leader in exploring how to best exploit this technology in delivering government services and a deliberate initiative for developing a blockchain strategy.[3] The initiative will create a comprehensive strategy that includes security, privacy, scalability, understanding of the speed and performance for validating transactions, integration with legacy systems, and currency volatility.

While its future remains uncharted, the state of Illinois believes blockchain holds tangible promise for Illinois' citizens and businesses, which is why it is committed to exploring and embracing the technology's potential for the state. As Illinois moves forward, it offers an open invitation to all government entities, businesses, organizations and academia interested in participating in this exciting opportunity to join the state in exploring the potential of blockchain technology.

Advice to State Government: Prepare for Blockchain

It can be expected that the business and technology of blockchain will evolve over time. There will be lessons learned, best practices, standards, legislation and regulation, all in time. Based on the wide range of potential business transactions, there is broad stakeholder group in state government that should be engaged in early discussions. How will blockchain fit into the enterprise business and technology architecture of the state? Like many transformative technologies, blockchain adoption could be disruptive if not approached in an enterprise way with a clear roadmap to guide decisions and investments.

Early Stage Recommendations:

1. Begin research of blockchain technology and economics now so states can begin to grow their knowledge.

2. Given this basic knowledge, begin to explore some potential use cases to better understand how blockchains may disrupt or enable your organization.

3. Consider developing a preliminary strategy on how you could adopt blockchain technology for future use.

4. Create a state stakeholder group (from both business and technology) to inform the preliminary strategy.

5. Identify relevant use cases to harvest the benefits of blockchain technology for your organization.

Key Question

What conferences should we attend?
What online training is available?

As industry and other jurisdictions
pursue blockchain technology,
what should we anticipate in terms
of impact and expectations of
state government? Regulations,
standards, audit.

6. Develop or join a collaborative with other organizations to share understanding and explore blockchain opportunities. Share knowledge and experience regarding cost reduction and innovation.

Key Questions:

1. Do we really understand blockchain and its applicability for our organization?

2. Where should we be experimenting with blockchains now?

3. Where could a blockchain inform a current process? e.g., supply chain management

4. Where could a blockchain fundamentally change a business process?

5. Are there certain business processes that become obsolete?

6. What are the risks associated with moving too quickly with an investment? What is an appropriate investment?

7. Do we really understand blockchain and its applicability for our organization?

8. Where do I obtain expert consultancy?

9. What conferences should we attend? What online training is available?

10. As industry and other jurisdictions pursue blockchain technology, what should we anticipate in terms of impact and expectations of state government? Regulations, standards, audit.

What is coming can be anticipated given our experience with other transformative technologies. Standards and best practices will begin to arrive. Expert consultants and certifications will appear. Success stories and some "not so successful" stories will be shared.

Stay tuned to NASCIO. We will be delivering webinars, publishing reports and holding conference sessions on this topic – all intended to inform and explore possible ways to exploit emerging blockchain technology and economics.

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- Graphics used in this report are from the State of Illinois Blockchain Initiative presentation, "Insights, Progress & Horizon Scanning, Illinois Blockchain Initiative." Presentation at the DC Blockchain Summit, March 16, 2017.

(Endnotes)

1. Swan, M., "Bitcoin Protocols 1.0 and 2.0 Explained in the Series: Blockchain: The Information Technology of the Future." *Institute for Blockchain Studies*. http://blockchainstudies.org/index.html. Presentation accessed on 3/28/2017 from https://www.slideshare.net/lablogga/bitcoin-protocols-10-and-20-explained-in-the-series-blockchain-the-information-technology-of-the-future.

2. Wons, Mike. "Digital Transformation in Government, The Illinois Blockchain Initiative." NASCIO Enterprise Architecture & Governance Committee Monthly Conference Call, March 9, 2017. Presentation and discussion by Mr. Mike Wons, Chief Technology Officer, State of Illinois.

3. State of Illinois Blockchain Initiative, https://www2.illinois.gov/sites/doit/pages/BlockChainInitiative.aspx.