

BLOCKCHAIN FOR HEALTHCARE ANALYSIS

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TECHNOLOGY OVERVIEW

Blockchain is a distributed digital ledger in which records of transactions are shared, updated, and maintained in an immutable manner across multiple computers that are linked together in a peer-to-peer network. The term “block” and “chain” in this context refers to digital information (the “block”) stored in a publicly visible and sequential data structure (the “chain”). As a digital ledger, “blocks” are used to record transactions across a network. Blocks cannot be changed retroactively without the alteration of all subsequent blocks in the chain, or through the majority consensus of the participating nodes.

Nodes form the participating peer-to-peer network of a blockchain. All nodes are linked to each other and constantly exchange the latest data to maintain and share the current state of the ledger. Since each node in the network maintains and views a copy of the ledger, there is no single point of failure, or more than one source of truth regarding the related records. Information is encrypted and added as a new “block” to the chain regularly as transactions are propagated throughout the network at fixed intervals. Various governance protocols (e.g. Bitcoin’s proof-of-work mining) are utilized to validate a new block to form consensus amongst the participants before a block can be added to the chain.

Blockchain’s technical advantage is that it is a decentralized architecture, meaning information is verified and exchanged without having to rely on a third-party. Organizations can now share and maintain control of digital records through ultra-high encryption in a transparent and traceable way without relying on entities that function as data gatekeepers.

Furthermore, what makes blockchain’s encryption so effective is that it processes information through a hashing algorithm. These algorithms convert any form of data into long, complex alphanumeric strings that are not backwards compatible (at least in theory without the means of quantum computing). Hashes are the unique digital fingerprints of both transactions and blocks. Every form of data (text, media, etc.) will have its own unique identifier as it processed by a hashing algorithm. This forms a process in which information can be transferred and stored securely without revealing underlying content.

The characteristics of blockchain technology are appealing for application with many industries, including healthcare, and is quickly gaining traction as a viable IT solution to complex data processes, record storage, transaction verification, cyber security, and system integration needs.

FIGURE 1: SAMPLE BLOCKCHAIN AND BLOCK DETAILS

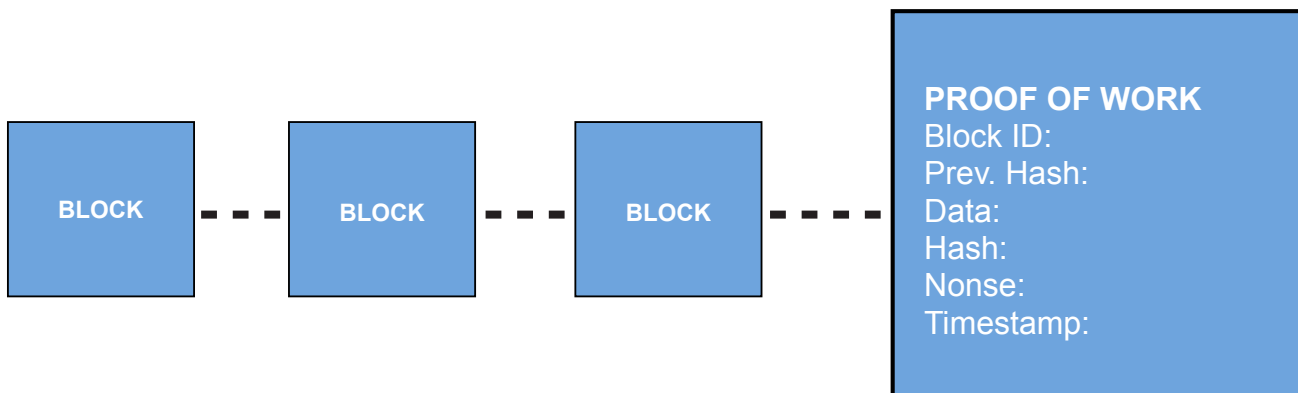
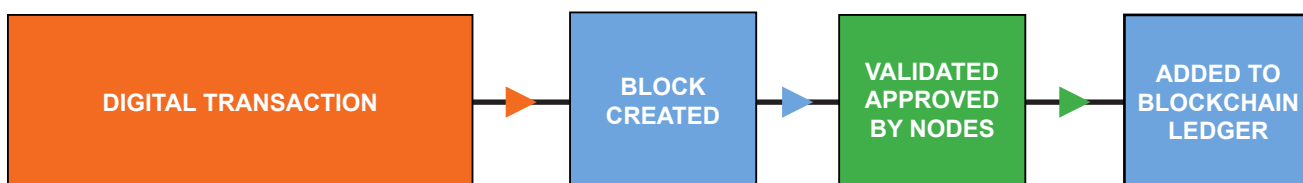


FIGURE 2: BLOCKCHAIN TRANSACTION PROCESS FLOW DIAGRAM



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HEALTHCARE APPLICATION

The application of Blockchain in healthcare is intended to enhance the method in which electronic medical information is securely accessed, exchanged, and protected. Healthcare is a data-driven domain with vast amounts of patient information. Electronic Medical Records (EMRs) represent an ideal application for blockchain as a secure mechanism for managing EMRs throughout a healthcare IT network.

Data Access, Exchange, and Security

The time-consuming process for clinicians to access patient medical records extend resources, capacity, and utilization, and ultimately delays the immediacy of critical patient care. In addition, IT network vulnerabilities, and growing integration of cloud-based data storage, is requiring healthcare systems to make investments to bolster cyber security through cryptographic databases, especially to meet HIPAA compliance regulations of EMRs. These security challenges position blockchain as a viable solution. Blockchain's decentralized ledger structure facilitates a secure means to access and exchange patient medical records, accessible only through levels of permissions granted to approved clinicians and administrators. The encrypted nature of blockchain makes EMRs accessible only through a patient's private key, and functions as a high-level security means to protect patient data across healthcare IT platforms and networks.

Patient Identity Protection

While blockchain is transparent, it also has the capability to conceal the identity of patients when using data for outcome studies and statistical research, while maintaining strict compliance with HIPAA rules.

DISCUSSION

We could soon see strategic IT applications of blockchain-based solutions in healthcare to significantly enhance the efficiency and quality of patient care. To operationalize a blockchain solution, several technical and non-technical components are required. First, the architecture of the blockchain system must include an API or integration component in order for data to flow seamlessly. This is required to demonstrate the availability and accessibility of the ledger. At the same time, a blockchain in healthcare requires a proper governance model to ensure that PII Type 3 is secured and distributed in accordance to the laws set forth in the country of use.

Next, a value proposition must be established and agreed across the healthcare organization. Value propositions are helpful in establishing the vision of the blockchain implementation and obtaining "buy-in" from senior leadership.

Finally, change management within the organization will multiply the value realized from blockchain. The people that impact the day-to-day operations of the healthcare organization will need to learn and understand the value of blockchain and how it enhance existing processes, to catalyze end-user adoption.

FIGURE 3: EMR SYSTEM UTILIZING BLOCKCHAIN

