USE OF BLOCKCHAIN TO PRESERVE DIGITAL CHAIN OF CUSTODY FOR SEXUAL ASSAULT EVIDENCE

Abstract

In the last decade, blockchain technology has made its place in various industries, transforming thinking, processes, and protocols that require transparency, security, accountability, and immutability. One unexplored area in which blockchain can make a significant impact is the creation and maintenance of a digital chain of custody for sexual assault evidence. The reliability, integrity, and accountability of handling crucial evidence can be enhanced by the unique capabilities of blockchain, ultimately bolstering the pursuit of justice for survivors.

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I. INTRODUCTION

The current system for handling evidence for sexual assault cases faces numerous challenges such as potential tampering, human error, and a lack of transparency. While new sexual assault kit tracking systems implemented recently by states in the US[1][2] provide some visibility into the process, there still exist issues that can undermine the credibility of the evidence, hindering the pursuit of justice and causing additional trauma for survivors. It is crucial to address these limitations and explore innovative solutions that leverage technology to improve the chain of custody process.

II. THE POTENTIAL OF BLOCKCHAIN TECHNOLOGY

Blockchain offers an immutable, transparent, and decentralized solution that can transform processes and protocols involved in handling and documenting evidence. Every step of the evidence collection, storage, transfer, and analysis can be securely recorded and time stamped in an immutable manner by utilizing blockchain [3]. This digital ledger preserves the integrity of the evidence throughout the entire lifecycle, thereby reducing the risk of evidence tampering.

1. **Enhancing Transparency and Accountability:** Blockchain technology allows for real-time visibility into the entire process, enabling stakeholders, such as law enforcement, forensic labs, legal professionals, advocates, and Sexual Assault Nurse Examiners to create, access, and verify the chain of custody records [4]. As each action is recorded and can be traced back to the responsible party, the technology fosters trust and accountability while also strengthening the evidentiary value. This visibility also increases the confidence of the survivors and the criminal justice system in the integrity of the evidence.

2. **Ensuring Privacy and Confidentiality:** Sexual assault evidence is highly sensitive in nature. It requires stringent privacy and security measures. Blockchain transactions are verified and stored across multiple nodes in the network. These and other additional cryptographic protocols make it resistant to hacking or data manipulation, further helping safeguard the privacy, security, and confidentiality of survivor information. Additionally, access controls can be applied to ensure that sensitive information within the chain of custody remains secure and accessible only to authorized parties.

3. **Preservation of Evidence:** Blockchain technology provides a secure and decentralized storage mechanism for preserving digital evidence, ensuring its long-term availability and accessibility. As sexual assault kits are often added onto a backlog [5], by leveraging distributed storage solutions, blockchain reduces the risk of data loss or corruption, thereby preserving the evidentiary value of sexual assault evidence over time[6].

4. **Collaborative Approach and Standardization:** Developing and implementing blockchain technology for chain of custody purposes is an interdisciplinary collaboration with stakeholders including law enforcement agencies, experts, legal professionals, technology providers, advocacy centers and forensic nurse associations. Industry standards and best practices need to be established together to ensure the interoperability,

compatibility, and scalability of blockchain solutions across jurisdictions, leading to a more consistent and efficient approach to handling sexual assault evidence.

III. EXAMPLES OF PRODUCTS USING BLOCKCHAIN TECHNOLOGY

While the use of Blockchain technology is not a widely adopted solution for sexual assault evidence, many companies are applying blockchain to digital forensics. Blockchain forensics is increasingly being used for criminal, terrorist and other illicit activities requiring investigations. Companies are using specialized blockchain analytics tools to provide a robust solution for investigators. Companies like Chain of Things [7] and Ever ledger[8], mainly focused on supply chain, include chain of custody tracking for physical items like food, medicine, and manufactured goods and even other high value items like diamonds and fine art. Guard Time has developed a signature keyless blockchain infrastructure to ensure integrity of systems and data [9]. Similarly, Factom[10] provides a blockchain data provenance platform to preserve and provide authenticity of records and digital assets, including those used for internal investigations. Cipher Trace[11] and Elementus[12] have developed crypto currency intelligence tools for tracing blockchain transactions and work with banks, regulators, law enforcement and other financial institutions and government agencies to identify illicit and/or fraudulent crypto transactions and analyze blockchain data.

Another major application area for blockchain technology is healthcare, where blockchain is being applied to improve security, interoperability, transparency, and efficiency. Platforms like Patientory use blockchain for a decentralized patient data management and access system [13].

IV. POTENTIAL CHALLENGES OF USING BLOCKCHAIN TECHNOLOGY TO CREATE AND PRESERVE DIGITAL CHAIN OF CUSTODY FOR SEXUAL ASSAULT EVIDENCE

While the benefits and impact of using blockchain technology for chain of custody purposes are promising, it is important to also consider the technical and non-technical challenges of implementing such a system successfully:

1. Technical Challenges

- Integration with legacy systems. One big challenge will be to integrate the existing systems of different stakeholders involved such as the police, medical systems, lawyers, regulators to the new systems of blockchain networks and IoT devices.
- Limitations to scale. Most blockchains still face space and speed limitations which can pose an issue in large, complex datasets related to complex cases.
- Due to the inherent nature of how a blockchain works, they rely on usage by a large number of people to be more secure and immutable. A chain with a small number of users could be prone to vulnerabilities.
- Sensitive data being stored on a public chain is another major concern with full exposure of any collected personal identifiable information, potential health information and other kinds of evidence. However, this can be mitigated by using a private chain to limit exposure.

2. Non-technical Challenges

- Implementation costs. Blockchain systems have significant costs upfront than traditional database solutions. Due to the complex nature of the development and integration of the system, special expertise is also needed. All such factors add to increasing the total cost of the solution.
- Physical handoff must occur reliably along with hashes added to a blockchain to support real-world custody. Data errors can still be recorded immutably if a reliable process is not properly followed. Proper steps should also be put into place to support corrections.
- A public blockchain is not controlled by a central authority so a change mechanism may be complex and even at times, political. This may not be a concern with a private blockchain but in that case, the question of who's the governing authority should be properly addressed.
- Adoption by stakeholders involved in the custody of evidence may be a long and complex process.

V. CONCLUSION

By leveraging blockchain's inherent features of transparency, accountability, privacy, and immutability, we can enhance the credibility of evidence, provide survivors with a stronger voice, and empower the justice system to deliver swift and fair outcomes.

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