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Award Abstract # 2341319
SBIR Phase I: File-Based Digital Assets

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Recipient: KNOX NETWORKS, INC.

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ABSTRACT

The broader impact/commercial potential of this Small Business Innovation Research (SBIR) project is to develop a novel technical approach to regulated forms of digital money and securities, including money and government securities, commercial bank money and corporate securities, and others via tokenization of File-Based Digital Assets (FBDAs). Tokenization represents a new frontier in finance that was originally pioneered in blockchain and cryptocurrency, and has many commercial applications to make payments and securities settlement faster, more transparent, and more reliable in the current regulatory environment. FBDAs are not blockchain based and can improve upon existing global payment solutions in making systems more scalable, easier to integrate with other payment systems, and more privacy-enhancing for institutions and consumers. The platform also allows for open sourcing and increased financial inclusion through the digital identity solution which gives the ability to move assets without friction globally. The commercial potential of FBDAs is significant, and tokenization products can be sold to domestic and international commercial and central banks, and allow third-party providers to build out their own financial products. This project will explore the technical market for FBDA-based tokenization and gain user feedback to improve the technology's commercialization potential.

This SBIR Phase I project proposes to research and create a production-ready (99.999% availability with defined RPO/RTOs) File-Based Digital Assets (FBDAs) product, a novel tokenization scheme applicable to not only currencies and tokenized deposits, but also to securities and other assets. FBDAs improve upon many of the issues that Distributed Ledger Technology (DLT) and traditional database systems have, particularly in the realms of scalability, interoperability, privacy, and programmability. FBDAs utilize a flexible fixed-denomination asset design that is simpler and more robust than Unspent Transaction Output

UTXO-based systems while beating the performance of Account-based systems. In addition, FBDAs allow for a disaggregation of the asset layer from the transaction layer, thereby allowing for easier separation of Personally Identifiable Information (PII) and from programmability rules for specific transactions. The Phase I project proposes to further explore different design choices of FBDAs and get technical and customer validation on achieving scalability, interoperability and privacy prior to large scale commercialization. The Phase I project will include a sandbox environment to test out different architectural setups, modeling of different financial instruments to expand tokenization potential, and to receive customer feedback from real-world financial institutions.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

PROJECT OUTCOMES REPORT

Disclaimer

This Project Outcomes Report for the General Public is displayed verbatim as submitted by the Principal Investigator (PI) for this award. Any opinions, findings, and conclusions or recommendations expressed in this Report are those of the PI and do not necessarily reflect the views of the National Science Foundation; NSF has not approved or endorsed its content.

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Tokenization platforms are currently being tested and used for improving the traditional finance system (within the established, regulated, two-tier banking system and NOT decentralized finance "DeFi") with smarter financial instruments. Tokenization looks to solve some of the existing problems of the financial plumbing, including improved operational efficiency for moving financial instruments around the globe. Improvements in this space would lead to lower costs and pain points for consumers, businesses, and financial institutions by bringing finance into the truly digital world. In addition, tokenization also looks to bring improvements to the financial system regarding more opportunities for democratized finance (e.g. purchasing investments at a lower minimum buy-in).

As described in the US House of Representatives Financial Services Committee hearing titled "Next Generation Infrastructure: How Tokenization of Real-World Assets Will Facilitate Efficient Markets" lays out, tokenization looks to bring tremendous upside to the American people and economy through a novel method of representing financial instruments.

Despite this potential business upside, there are many technological challenges that have emerged from largely co-opting systems built for decentralized cryptocurrencies and using them for traditional financial applications. Of particular note, there are problems with regard to scalability and to complexity presented to organizations.

Knox has developed a differentiated technological approach to help mitigate these challenges presented by Blockchain/DLT.

Knox Networks Inc. has continued to further develop a novel shared ledger, tokenization and transaction platform that builds upon common database technologies, and does not rely on the use of complicated Blockchains and Distributed Ledger Technologies (DLTs). Knox's system is useful for improved scalability, interoperability, programmability, and maintainability over existing blockchain/DLT solutions, and provides an alternative technological option for financial institutions seeking to modernize their systems.

Knox has used the funding from SBIR Phase I to support the further development of the Knox system, including for development, testing and conducting a proof-of-concept project with an external multilateral organization to improve the functionality of Knox's interoperability solution. Knox's findings demonstrate that the technology developed by Knox without the use of DLT can properly interoperate with other DLT technology to provide safer transactions across multiple systems, such as may be required for transacting in different currencies or financial asset types.

Knox demonstrated this ability through a simulated cross-border project with a multilateral institution, which included a mock international central bank digital currency (CBDC) network. Acting as the technology vendor for one of the jurisdictions within this project, Knox was able to show how blockchain technology is not an inherent requirement for solving the problems financial tokenization is trying to solve.

Through this project, Knox's findings demonstrate that the technology developed by Knox without the use of DLT can properly interoperate with other DLT technology to provide safer transactions across multiple systems, such as may be required for transacting in different currencies or financial asset types.

Hashed Timelock Contracts (HTLCs) as used in this project were used to transact tokenized cash (wCBDC) across different simulated currencies, but HTLCs are also applicable for transacting across a variety of different tokenized assets. This helps solidify the idea that interoperability must be a cornerstone of designing tokenized systems for the future, and existing payment message standards such as ISO 20022 continue to be useful in tokenized transactions. At the same time, further efforts should be invested to enhance and carry rich data about financial instruments.

In addition, it is very evident on the numerous steps/checks (FX rate, alias lookup, sanctions) in cross border that can benefit from automation compared to status quo systems. In addition, there is a strong need for coordination about personal information sharing for sanctions screening, in ways that could potentially help improve the privacy experience in cross-border payments while still maintaining compliance.

This finding will be augmented by further research into developing an even more robust tokenization platform which can be used to model a greater number of financial instruments and fit in a greater number of use cases, including central bank digital currencies, tokenized bank deposits, and securities, and more; in addition to improvements in privacy-enhancing technologies, auditability, and programmability. These use cases and improvements are being explored in financial institutions both domestically and internationally, and Knox seeks to help maintain the lead the US financial system has globally through an innovative and unorthodox approach to helping to modernize financial technology.

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