
Data Security for the Internet of Things



By Andrew Shipilov , INSEAD Professor of Strategy

Machine-to-machine transactions entail risks as well as an opportunity to create a digital blue ocean.

Distributed ledger technologies (DLT), commonly referred to as blockchain technology, are likely to disrupt many industries. Although blockchain's potential for transforming financial services is well known, this technology's impact on other areas is less understood. To learn how DLT can facilitate the Internet-of-Things (IoT) revolution, I interviewed Wilfried Pimenta de Miranda (INSEAD GEMBA '13), Head of Business Development at the IOTA Foundation. This is what I learnt:

IOTA is a non-profit foundation registered in Germany. IOTA's founders have developed the Tangle, an open-source communication and transaction protocol for the IoT. Blockchain remains an early-stage technology which is yet to reach production readiness and large-scale deployment across industries.

Five years ago, the IOTA founders recognised that there were several intrinsic limitations to conventional public blockchains. For example, as these

networks become popular and see an increasing number of transactions, they suffer from increasing fees and decreasing speed. These two issues are deal-breakers for many industrial use cases. Furthermore, if blockchain were to be developed for the IoT, it would have to be run on equipment (like sensors or actuators) with limited storage capacity and energy resources contributing to the network. By contrast, conventional mining-based blockchain technology protocols are very energy-consuming and require high storage capacity.

How it works

The open-source IOTA Tangle protocol enhances data security, integrity and privacy for machine-to-machine (M2M) communication, without any fees. In addition, where value transfer is needed to support a business model or data monetisation, IOTA provides an optional real time zero-fee transaction feature.

Let's take a concrete example: smart mobility. With no driver onboard, the self-driving vehicles will need to be able to pay for smart charging, parking, toll gates or other smart-city utilities. These M2M interactions must happen in real time, provide high security and respect the privacy of users. As data storage grows increasingly decentralised, data integrity – the ability to ensure that data have not been tampered with – will become critical.

To make these transactions possible, IOTA created a digital currency called the IOTA token. In contrast to blockchain-based cryptocurrencies which generally suffer from lack of scalability and volatile transaction fees, the IOTA token enables zero-fee transactions and is designed as a universal payment protocol for the IoT. In other words, your self-driving car can use IOTA tokens as digital cash to effect micropayments for electricity while you are enjoying your morning coffee.

Here is a short community video that explains how the IOTA protocol works:

In IOTA there are no “blocks” in the classical sense. Instead, each transaction references two past transactions. This referencing acts as a confirmation system: With your transaction, you attest directly that two transactions, and indirectly that a subsection of the Tangle's blockchain, are valid and conform to the protocol's rules. Instead of a small subset of the network being

responsible for consensus, all active participants (i.e. devices making transactions) are directly involved in the approval of transactions. As such, consensus in IOTA is no longer decoupled from the transaction-making process: It's an intrinsic part of it and enables IOTA to scale without charging transaction fees.

A blue ocean for the Tangle

As of today, IOTA is not in production-ready stage, but its roadmap to industry deployment is catalysed by pilots which facilitate the world's 10th largest cryptocurrency. The foundation is working to develop a global IoT standard for and with the industry via numerous joint projects in smart mobility, smart energy, smart buildings, smart farming, global trade and supply chains, as well as eHealth.

In the smart mobility sector, for example, Enexis, a Dutch grid company, and ElaadNL, a related knowledge and innovation centre, have been experimenting with building IOTA-enabled charging solutions that are also incorporated into a smart grid. The partners are now going to pilot a prototype of this technology in Sweden in a smart-energy community testbed.

Robert Bosch Venture Capital has invested in a cryptocurrency based on IOTA's technology. C-level managers from Volkswagen and Fujitsu sit on the supervisory board of IOTA. Today, hundreds of other leading organisations across industries and geographies are experimenting with the technology, including ENGIE, Orange, EY, Accenture and DNV GL.

Although IOTA operates as a non-profit foundation, it is subject to the same organisational challenges as any global high-tech start-up. It must move out of stealth mode to build structures and processes to support growth across the world. Aside from developing high-speed technology and hundreds of corporate and institutional relationships, it must manage the expectations of thousands of IOTA enthusiasts globally.

As IOTA moves forward, it will continue innovating with partners to create reference cases and blueprints worth sharing. Because IOTA is enabling a digital blue ocean (where the non-customers are machines), it strives to catalyse digital and physical spaces for co-creation in the IoT space across the globe. This can range from prototyping smart labs to piloting testbed environments and pure digital sandboxes with innovators willing to

experiment with IOTA's technology.

If your machine has an e-wallet in the future, it is likely to be denominated in IOTA. The next steps are to move from the testnet to real-world industrial applications. It would be good to revisit the foundation's work in a year's time to see what's been accomplished.

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