Blockchain-led Software Development is the Way to Go

Abstract

Blockchain is being seen as a major contributor to emerging computing paradigms. Still in its nascent stage, there is constant demand for new use cases to explore the potential and exponential value that this new technology can generate.

We believe blockchain can bring great value to software companies developing digital products that leverage innovative technologies and are delivered over multiple channels. Its capabilities in enabling secure, real-time sharing of data across entities and automation of transactions and settlements through smart contracts can deliver the enhanced efficiency and security critical to software products today. With adoption of the Software as a Service (SaaS) model and high levels of customizations becoming the norm, implementing blockchain in the products value chain could well become a prerequisite for the software industry.

This paper discusses three use cases for blockchain in the software product industry amid contextualizing specific capabilities of this technology in solving challenges faced by the industry.

Blockchain has been a game-changer in terms of building in high levels of reliability and automation within processes. Software product companies are now looking to leverage it to transform how their products deliver value to users.

Why Blockchain

Blockchain is essentially a decentralized, transparent ledger with transaction records. The database is shared and updated across multiple network nodes (decentralized), monitored by everyone (transparent), and owned or controlled by no one. It can be compared to a gigantic interactive spreadsheet where everyone can access data, view updates, and confirm unique digital transactions. An important difference though is that any update to an existing transaction is added as a new 'block'; the existing one doesn't get overwritten! This makes all transactions immutable, bringing a lot of trust to the system. Unique cryptographic coding makes transactions on the blockchain easily traceable and highly secure, while the ability to develop and activate smart contracts across participants makes them automated.

The software product industry is going through rapid technology and operating model changes, with 'platformization' or 'everything as a service' being the trending theme. Software companies are developing cloud-based Software-as-a-Service (SaaS) products and customers are rapidly migrating to subscription based models. The products being developed have to be customized for varied audiences across channels, such as desktop, laptop, mobile, or wearables. Apart from this, given the deluge of technology advances, software companies need to be able to adapt readily and brace for unforeseen scenarios.

Enabling Continuous Evolution of Software Products

As more and more enterprises adopt blockchain frameworks, software companies will have to make products that are easy to integrate with blockchain solutions.
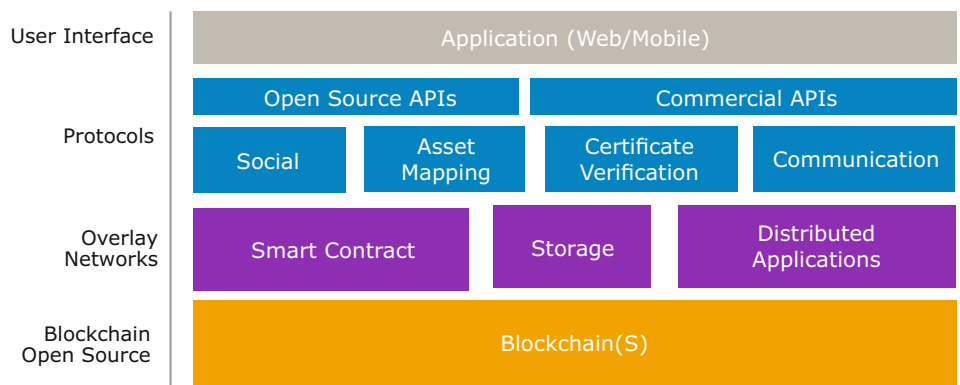

Figure 1: A Typical Blockchain Stack

A typical blockchain stack (see Figure 1) has the following four levels:

- User Interface

- Protocols

- Overlay networks

- OpenSource blockchains

The user interface level, which is typically web-based, can be customized for user experience across channels (such as mobile, wearables) depending upon the type of product.

The protocol layer is a software system that transfers over the blockchain ledger. Decentralized protocols are the most crucial part in the blockchain stack – they help peers to connect to datasets simultaneously, avoiding the dependency on single entities for validations, transactions, and so on. The blockchain is typically managed by a peer-to-peer network that collectively adheres to the protocol for inter-node communication and validates new blocks.

The underlying layer is that of networks, which are built on top of other networks and support the shared ledger, smart contracts, and storage. The transactions are carried out through virtual links and added to the public ledger after gaining consensus (smart contracts, agreement) through a proof-of-work system (mining).

The implementation layer or the blockchain open source layer is used to maintain a continuously growing list of records (called blocks) that record transactions chronologically.

Figure 2 illustrates a typical supply chain management (SCM) scenario to explain how a software product can be integrated into the blockchain. We know that the supply chain function is one of the earliest adopters of blockchain. The traditional SCM software treated all the vendors as separate entities or modules, and the transactions took place in a cyclic or sequential fashion. With the onset of blockchain, these modules are interconnected and each of these nodes will conform to the architecture described above. A shared ledger is updated and validated in real time with each participant, according to the prescribed smart contract. Such a blockchain-enabled system can therefore improve supply chain transparency and security. It will ensure faster, automated transactions and reduce effective costs.
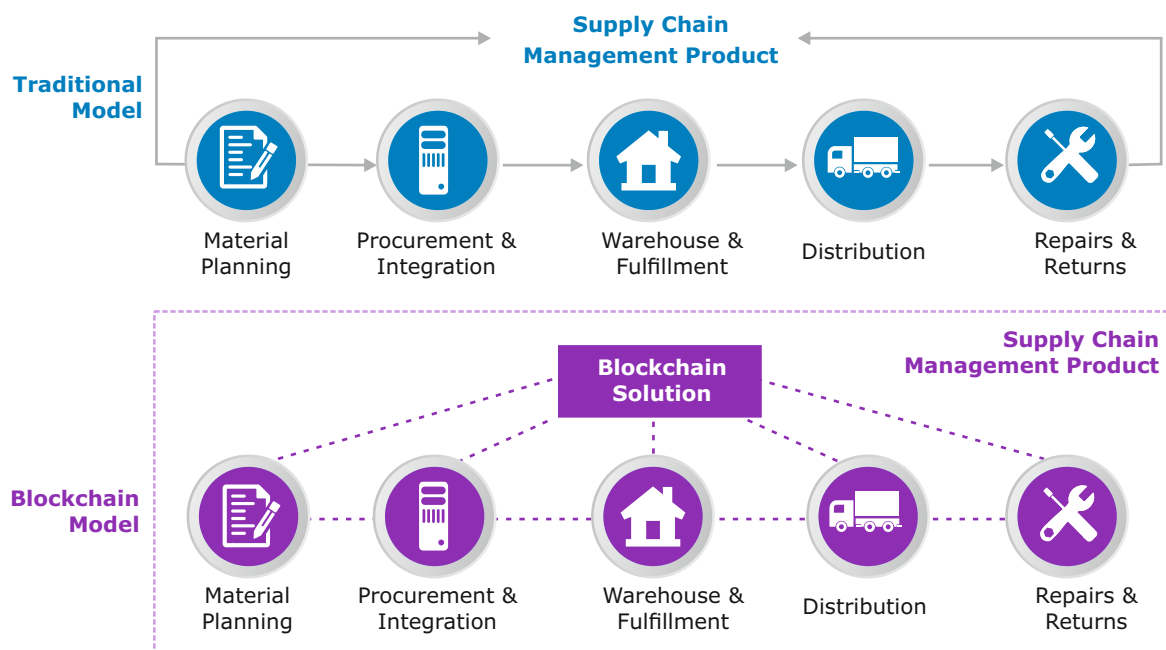
Figure 2: Illustration of a Blockchain-Enabled Supply Chain Management Model

Improving Billing Cycles for SaaS-based Products

The software product industry has seen a significant shift from licensed, on-premise products to cloud based, SaaS products that follow the 'pay-per-use' model. Thus, billing and cost models have evolved significantly with regard to software products. Revenue streams for software product companies can be based on numerous pricing models like transaction-based pricing, cyclic billing, in-app purchases (mobile products), revenue sharing with strategic business partners, licensing and consulting fees, as well as subscription-based or account-based billing. Across these models, the companies face challenges in managing the complexities for varied audiences and high third-party costs, while maintaining transparency.

SaaS product companies can effectively manage customer onboarding and commercials by implementing blockchain. Processes like payment management, metering functionality, validation, verification, and authentication would be automated, removing the dependency on human intervention, thereby eliminating delays and making the transaction more trustworthy and secure. With a distributed database mechanism rather than a central record keeping system, blockchain technology leverages the ecosystem by storing identical
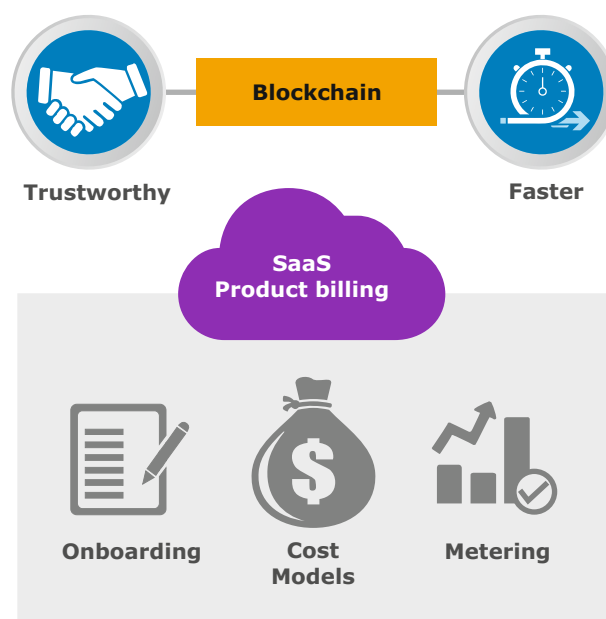
Figure 3: Blockchain-Enabled SaaS Billing

transactions at every node connected to the network. This involves transaction sign-off from a large number of participating nodes, ensuring 100% transparency and seamless tracking. It also mandates automation of transaction processing, which improves efficiency of the entire billing procedure.

As no central authority or third-party mediator is involved, middle men costs are eliminated. Every record in the distributed ledger has a timestamp and unique cryptographic signature, with immutable history of all transactions in the network. Smart contracts define the business rules and penalties around the agreement made and automatically enforce those obligations. Specially formulated cryptocurrency (encrypted, decentralized digital currency) can also be used for financial transactions among entities. Thus, funds can be transferred independently and securely depending on the cost model being implemented.

Building Trust in Next-gen Products

Software products capture a lot of customers' personal data such as name, email addresses, and more, along with a high amount of data around user-specific behaviors and patterns. Moreover, in the context of next-generation products, this data is being collected through multiple digital channels such as mobiles, desktops, and wearables, resulting in a huge amount of scattered personal data across the ecosystem. As more customized products are created, this kind of data will be

leveraged heavily. With growing regulatory oversight in this area, the stakeholders of this data need to build in transparency and security in its usage.
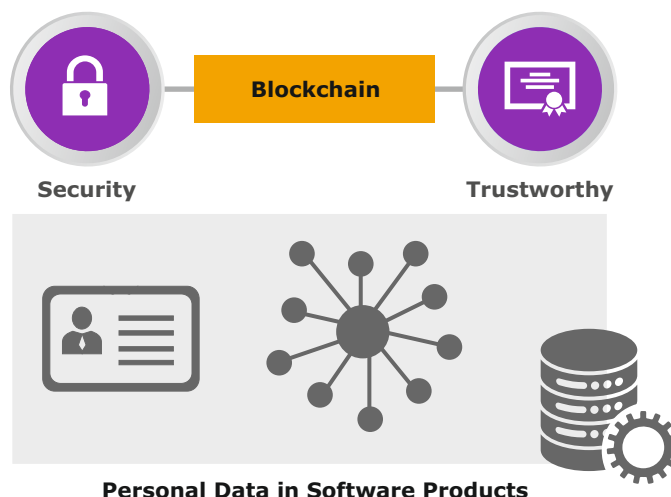

Personal Data in Software Products

Figure 4: Blockchain Brings Trust to Storage and Use of Personal Data

Blockchain can play an important role in building trust in such scenarios. For example, it would be important to establish that the data being used is authentic and not from incorrect sources. A shared ledger system; along with immutable transparent transactions, can establish the level of trust of an identity based on who trusts or confirms the identity. It forms an attestation infrastructure for customer identity and data.

Additionally, a challenge with personal information could be that multiple parties in the value chain store the information at different places, leading to duplication. Most of the times these parties are unaware that the information exists elsewhere. Each party has their own mechanism to store and control the data, which makes this data vulnerable. This creates a 'weakest link' security problem as the data is only as secure as the least secure party. Software companies are thus exposed to bigger penalties if the data is not handled appropriately. Blockchain, with its single, decentralized database, offers the perfect solution to this scenario. We also recommend the provisioning of personal information over blockchain-as-a-service solutions, so that the information is even more secure, used only when required, and that too by the right entities and with an auditable record of use.

This is Just the Beginning

The three use cases are just indicative of the exponential value software product companies can bring into their products by adopting blockchain. Smart contracts can prevent the copying and redistribution of software, thus evolving into tools for protecting the Intellectual Property (IP) of software products - a challenge for most product companies today. Distributed ledgers are extremely useful in software products where multiple entities are involved and approval or attestation is needed from third parties; for example, educational, criminal and nationality checks during the hiring process in human resources products. Blockchain can help in faster and more transparent processes here. To truly understand the extent of its impact, therefore, software companies will need to think out of the box with regard to using blockchain to transform the way their products are designed, delivered, and managed.

About The Author

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Nilima Kulkarni is a senior domain consultant with the Software Product Engineering group of TCS' HiTech business unit. With over 18 years of experience in the IT industry, she is responsible for new business growth in the software product engineering area. Kulkarni's responsibilities include trends and opportunities analysis, solution design, and market development. In her previous roles, she has managed large product engineering engagements for TCS' leading ISV clients. Kulkarni's areas of expertise include business development, technology consulting, client engagement, and program management. She has a Master's degree in Computer Applications from the Sinhgad Institute of Technology, Pune, India.

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