



Blockchain Revolution: How The Technology Changing Business

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ABSTRACT

Many existing business processes can be more effective and efficient with blockchain technology to save time, reduce risk and save money. Blockchain is a digital ledger where each block is linked to another block in a time stamped and every block has numbers of transaction with meta data like index, previous Hash and hash of that block. These hash make this digital ledger to an immutable public record of digital transactions. Every new transaction is validated by the other nodes across the distributed network before it is stored in a block. All transaction information once stored on the ledger is verifiable and auditable but not editable. With blockchains, business can establish what they are and then trade items like money, votes, deeds, intellectual property, stocks and bonds, loyalty points, and anything else that has value. One of the biggest divisions in blockchain technology is permissioned versus permissionless blockchains. Permissioned Blockchain is especially useful for the business that have to comply with regulations and wants to complete control of their data. Hyperledger works in this direction that has the aim of improving cross-industry permissioned blockchain technologies. In this paper we explained the some parameter for selecting platform of blockchain for business applications with some use cases and business people can also use Blockchain-as-a-service to deploy their own blockchain app easily that's managed and administered by cloud-based service providers.

Key words: Blockchain, permissionless and permissioned blockchain, blockchain-as –a-service, smart contract

1. INTRODUCTION

Blockchain is a distributed ledger, which simply means that a ledger is spread across the network among all peers (nodes) in the network. Every node has a copy of the Blockchain and once a block reaches a certain number of approved transactions then a new block is formed [1]. Blockchain can be classified into permissionless blockchain and permissioned blockchain. Permissioned Blockchain is very important and useful for business application because every business want the transparency and reliability [12] but upto some extent as

well as wants control on transaction flow [3]. Blockchain-as-a-Service that empowers businesses to rapidly build, deploy, and manage decentralized networks and services. Many company providing the Baas like Microsoft cloud computing platform Azure, BlockApps, chainstack, veechain etc. The blockchain-as-a-service platform conducts trustless transactions by running self-executing smart contracts and securely (and immutably) store data on the blockchain. Blockchain platform makes it easy to activate and manage a secure business network across multiple organizations. Blockchain is the mix of a common, unalterable record that streamline business procedures and open new doors for advancement. [6-11] Consensus in Blockchain is organized between individuals which wipes out expensive dangers and wasteful aspects as resources and change hands all through the business of Blockchain [13].

1.1 Permissioned vs Permissionless Blockchain

In a permissionless blockchain, the public validates transaction information. In permissioned systems blockchain's owner choose a particular group and only this group is responsible for validating the transaction information. Permissioned systems tend to be more scalable and faster as compare to permissionless but are more centralized. The basic distinction is that you need approval to use a permissioned blockchain, while anyone can participate in permissionless systems. The original Bitcoin blockchain was and is still completely open, for example, but as companies and institutions start to adopt the technology, they're willing to sacrifice trustlessness and transparency for better access controls and easier customization. Both permissioned and permissionless blockchains have some important characteristics in common:

- They're both distributed ledgers, meaning that there are multiple versions of the same data stored in different places and connected through some type of network.
- They both use some form of consensus mechanism, which means they have a way for multiple versions of the ledger to reach an agreement on what they should all actually look like.

- They are both theoretically immutable in the sense that the data they store can't be changed without having sufficient power over the network. Even then, the blocks are linked by cryptographic hashes that will change if any data is altered.

Put simply, both permissioned and permissionless blockchains use cryptography and decentralization to varying degrees to accurately store data in a format that is difficult to hack or alter.

A. *Permissionless Blockchain*

Most of the blockchains you've probably heard of fall into this category: Bitcoin, Ethereum, Litecoin, Dash, and Monero. Data stored on these chains is publicly available, and full copies of the ledgers are stored all around the world, which is what makes these systems very hard to hack or censor. No one runs the blockchain, no one can restrict access to it, and you can remain relatively anonymous since you don't need to identify yourself to get an address and perform transactions. Blockchains that anyone can transact on or even join as a validator. Of course, this system is far from perfect. It can be slow, difficult to build for and scale up on, too transparent to keep sensitive data on, hard to control access to, energy-intensive, and complex. That's why permissioned blockchains are becoming a more popular solution for companies and institutions looking to use blockchains to replace more traditional systems.

B. *Permissioned Blockchain*

Permissioned blockchains are only open to those who are allowed access. Anyone who wants to validate transactions and/or view data on the network has to be approved by the central authority first. This is especially useful for banks, companies, and other institutions that have to comply with regulations and might not be fans of losing complete control of their data. Instead of building on a large, decentralized blockchain like Ethereum, they can instead create a custom solution run only by institutions that they approve of. [2] The big advantages of permissioned blockchains are that they have:

- Access controls
- High customizability
- An easier time changing to comply with regulations
- Better energy-efficiency
- Potentially better scalability

There are disadvantages, too. They are:

- More centralized
- Less transparent
- More vulnerable to hacks and manipulation
- More easily censored
- Less anonymous

2. SELECTION OF BLOCKCHAIN PLATFORM FOR BUSINESS APPLICATIONS

With every organization looking at blockchain platform for solving the long standing problems in their respective areas and domain, it is often by default a blockchain platform is selected for the application development [16]. It is imperative that sufficient effort and time is spent on understanding the needs and requirements of the application vis-à-vis the blockchain platform features so that a proper fit is made. It should not left to just the development team to decide on this issue as once the implementation is under way major hurdles, both business and technical, may crop up and stall the project. This note presents a list of criteria for evaluating the blockchain platforms before zeroing in on the target environment so as to avoid heartburn as the project gets underway.

2.1 Purpose

The most important factor to consider blockchain implementation is its objective or purpose for which it is built. This is often overlooked by many implementation teams. Many popular blockchains are specialized for cryptocurrencies, which is not a surprise as these are based on the first Bitcoin's blockchain codebase. There are blockchains which provide ways to use it in non-financial applications by enabling support for significant data storage within transactions. It is imperative that the core objective of the blockchain implementation is understood before adopting for use in a business case.

2.2 Usability

Ease of use is another important aspect to consider before selecting a blockchain for application development. Some blockchain implementation require downloading and keeping the full set of nodes while others have different type clients that allow access to the blockchain's network without the need for complete set [17]. Apart from this, it is necessary to find out if the blockchain implementation is in open source; this feature can come in handy if there is a need to fork and create new set of mining rules for the potential application. Other factors affecting the usability are the number of methods available for interacting with the platform, viz., APIs, GUI and user clients. Reviewing the programming language support of the blockchain platform can help in deciding its usage for potential applications. Platforms using standard tools and languages are easier to adopt and use. Additional factors to look for are documentation, number of active user community groups and online support.

2.3 Governance

The governance of a blockchain can also decide that how it operates and what functionality it can do. Thus, one should consider who controls access to the ecosystem, and who

enforces decisions to make changes to the blockchain. If it is an open source activity there is high possibility that new ideas and approaches can be discussed and get implemented. Most blockchains require consensus from all participants or some percentage of participant in order to agree to a change on the blockchain. Some platforms which are in closed groups have a less flexibility and it may be difficult to utilize the blockchain for their particular application [17].

2.4 Performance

Performance is also one of the important aspect for blockchain usage. Performance can be measure by the following factors

- how fast transactions are accepted by the blockchain's network
- how much bandwidth it uses
- how much blockchain data needs to be stored
- in what way the data must be stored
- what is the size of the block and transaction sizes
- what is transaction rate

Depending on the application requirement and type, performance and latency needs to be thoroughly verified before selecting the platform.

2.5 Scalability

Scalability is the ability of the platform to behave as consistently as the network size, the number of nodes and transaction per second increase. Most blockchain implementations degrade as the number of nodes increase. This is a mandatory metric that needs to be studied as blockchain applications are typically global in nature and have the inherent need to scale, going forward.

2.6 Security

Some business applications need more security that's why these are looking at blockchain technology because of the enhanced security features that it provide. Security of transaction data, user anonymity and the security of the blockchain itself need to be considered before planning on using it for a business application.

3. BUSSINESS APPLICATION

Blockchain in Business means how the blockchain can be fitted in the business logic [15]. From supply chain to logistic management blockchain can be applied to the various business application such assets management, insurances, payments. There are number of use cases which are based on blockchain technology. Here we explained the smartcontract, banking sector, crypto currency and assets management.

3.1 Smart Contracts

As smart contract is essentially business logic running on a blockchain, smart contract layer is responsible for processing transaction requests across all these frameworks. Four of the Hyperledger blockchain frameworks support smart contracts [18], these are Hyperledger Burrow, Hyperledger Fabric, Hyperledger Iroha and Hyperledger Sawtooth. Each framework supports smart contracts but the way of dealing is slightly different. smart contracts can be very simple or complex as executing a contract with conditions attached. We can categorized the smart contract in two types Installed smart contracts [5].

A. Smart Contracts in Hyperledger Fabric

A smart contract in Hyperledger is known as chaincode. It is a piece of code that lets you interact with a network's shared ledger and it can be written in Go, JavaScript (node.js) and Java that implement a prescribed interface. Whenever you invoke a transaction on the network, you are effectively calling a function in a piece of chaincode that reads and writes values to the ledger. Chaincode services use Docker to host the chaincode. Docker provides a secured, lightweight method to sandbox chaincode execution. Environment is a secured container, along with a set of signed base images containing secure OS and chaincode language, runtime and SDK images for Go Lang. Additional programming languages can be enabled, if required. Secure Registry Services enable Secured Docker Registry of base Hyperledger images and custom images containing chaincodes[5]. There are two different types of chaincode to consider System chaincode which handles system-related transactions such as lifecycle management and policy configuration. However the system chaincode API is open for users to implement their application needs as well and Application chaincode which manages application states on the ledger, including digital assets or arbitrary data records. There are generally two ways to develop business contracts for Hyperledger Fabric:

- To code individual contracts into standalone instances of chaincode
- To use one chaincode to handle all contracts (of certain types) and have it expose APIs to manage lifecycle of those contracts. This second approach is probably more efficient.

3.2 Banking: Applying for a Loan

Banks want to lend, but only to borrowers who can easily repay their loans in future. The bank, therefore, collects detailed, personally identifiable information (PII) from everyone applying for the loan, such as date of birth, annual income, government ID or passport number and so on. Eventually, banks use this PII to reach the applicant's credit rating. Regulations may demand that certain PII is shared with some authorities to prevent the illegal process of concealing the origins of money obtained But as every bank

hold the so much PII, it makes every bank a soft targets for hackers. Loan process is not an easy task for borrowers. The application process is difficult and to find the minimum rate of interest borrowers may apply loan applications to many bank. Thus every new application attempt increases the risk of PII abuse multiplied by manifold. Hyperledger Indy provide a transition identity solution for this issue. With Indy, applicants only have to share information from which banks can make a decision in a way that assurance truth and develop faith in the lender, and satisfies pressures from regulators. Anyone can apply a loan application to number of different banks in millisecond without include any sensitive personal data into a hackable database. Without disclosing any personal identifiable information, loan applicant can use zero knowledge protocol, allow data to be verified without revealing that data. For example their income on last two year's taxes passed a certain threshold, that they hold a valid government ID number, and that their credit score met a certain threshold within the past week. Robust distributed ledger-based identity create global source, which provides useful information to many parties. Applicants can give their consent, banks can confirm on the deal and show immutable audit trail. Finally bank can offer loans to the applicants without the risk of abuse the PII of applicants.

3.3 Crypto-currencies

Now let's dive deep about its application in the financial sector. Financial sector was the first sector from where the concept of the Blockchain emerges. Blockchain comes through the existence of the bitcoin later on the concept behind this bitcoin was not restricted only to bitcoin, using technology behind it various application has be developed. In the financial sector the crypto-currencies is the one of the favourite application. Traditional financial systems was cumbersome, error prone and slow. Intermediaries are often needed to run the process which was very time consuming and lengthy process. Also it was not secure and cannot be proved that some particular amount belong to this person. In Contrast, Blockchain is much cheaper, more secure and no intermediaries are required to handle it. For this smart bonds and smart contract are used.

3.4 Assets Management

Assets Management can be also managed via blockchain. Assets management include the trade processing and settlement where parties trades and manages assets. Traditional trade process was very risky, a time taking process, particularly when it comes to the cross border settlement where trust is a major issue and the process is so cumbersome and clumsy. Cross border involve a number of parties such as broker, custodian, and other keeps their own set of record which create inefficiency and more prone to the error. Blockchain ledger reduces the by making the share ledger with it own copy. This digital ledger simplify the process and makes the transaction faster and cheaper.

4. BUSINESS ADOPTED BLOCKCHAIN: LATEST TRENDS

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4.1 Nestlé Blockchain: Transparency in Supply Chain

Nestlé depicts the company breaking new grounds with transparency in their supply chain. This appears to be a joint collaboration with OpenSC. OpenSC is a Blockchain platform that offers validation of product sourcing as well as sustainability data directly to its customers.

Previously, Nestlé had experimented with Blockchain by testing tracking and tracing initiatives like the IBM food trust. But, this will be the first time that it will be piloting an entirely open Blockchain information platform. This new pilot will be focusing majorly on tracing milk from the producers in New Zealand. This includes info down to the factories and even warehouses far away in the Middle East and it raises the bar for clarity and responsible production universally. It will be directly available to daily consumers through QR codes that can be scanned and also an open online platform. OpenSC was established as a joint initiative between the Boston Consulting Group's digital venture division and World Wildlife Fund. It supports sustainable and transparent supply chains in the food industry [14].

For now, the OpenSC platform majorly focuses on tracking meat and fish through the aid of RFID tags as well as IoT sensors which will be used in tracking individual products from the source down to the shelf. Nestlé aims to enable its consumers to make well-informed decisions on every product they select.

4.2 Oracle Protecting Bee Supply Chain

Oracle will help World Bee Project (WBP) to track and monitor bees in their hives using blockchain technology. Moreover, Oracle will develop a "BeeMark" label that will guarantee that honey produce is from ecological and sustainable sources. Recent research on honey products found that about 76% of the honey sold in grocery stores is fake. Some of it even contains toxins which can affect people's health. Blockchain provides the origins of honey, making it transparent for consumers to see exactly where their honey is coming from. This could then save people lives by identifying potentially harmful ingredients.

A.Helping Beekeepers and Suppliers

Using the Oracle Blockchain Platform, beekeepers, suppliers and other parties will be able to login information associated with beekeeping into an immutable database. Not only will this provide greater traceability of honey from hive to store, but it will also help prevent adulterated honey from finding its

way in stores. Information collection from supply chain parties occurs with rapid speed. In addition, uploading to the platform helps to guarantee that nothing is added or subtracted from the final product.

B. Monitoring Bees Behavior

Research shows that the global bee population is in drastic decline due to changing temperatures, habitat loss, and insecticides. Scientists have warned that bees are in trouble. The safety and the health of our environment and food supply cannot be taken for granted. The loss of insects has far-reaching consequences for the entire ecosystem. Bees pollinate food crops while insects provide food source for many birds, amphibians, bats and reptiles.

Among the solutions proposed to help mitigate this threat to pollinators is blockchain technology. Through the Oracle blockchain bee supply chain initiative, the company will monitor bee hives across the globe. This involves installing devices to track the health and behavioral changes of bees. For example, acoustic monitoring can improve the knowledge of bee farming by giving beekeeper real-time status of the bees' behavior, such as an impending swarm. Swarming is one of the most critical stages of beekeeping because, without a swarm, it would be impossible to sustain the bee community. By using blockchain distributed ledger to protect bee populations, Oracle is committing to ensure the sustainability of bee produce and continuity of bees.

5 . BLOCKCHAIN-AS-A-SERVICE

In BaaS third-party installs and maintains blockchain networks for a business or customers to purchase cloud-based solutions to build, host and use their own blockchain apps, smart contracts and functions on the blockchain ecosystem that's managed and administered by cloud-based service providers. It is a meaningful development in the blockchain ecosystem that blockchain adoption across businesses easily. Here we are giving some examples of Blockchain-as-a -Service companies who want to build and deploy private blockchain networks [14].

5.1 Microsoft cloud computing platform, Azure

Seamless development and deployment of innovative solutions to experiment easily with modular, preconfigured networks and infrastructure. Fast-paced development and validation of blockchain scenarios by using built-in connections to Azure and familiar tools to save development time. Secure storage of data on an open, trusted, globally available cloud platform and scalability as per application specifications and performance requirements. Enterprise-grade smart contracts functionality using Enterprise Smart Contracts and utilizes machine learning and big data technologies, code re-use and APIs for integration with non-blockchain functionality. Access to a wide range of blockchain networks for building applications (Corda, Ethereum, Hyperledger Fabric)

5.2 BLOCKAPPS

Enterprise blockchain-as-a-service solution allowing developers, startups, and enterprises to build and deploy enterprise-grade applications on blockchains. BlockApps was the first company to be developed on the ConsenSys platform. It enables development of decentralized blockchain networks and it provides secure, immutable storage of data using a single source of truth and access to insights and logistics through provision of real-time data. It has smart contracts functionality and API endpoints for implementing third-party features.

5.3 CHAINSTACK

Chainstack is a multi-cloud and multi-protocol Platform as a Service that empowers businesses to rapidly build, deploy, and manage decentralized networks and services.

Chainstack's user-friendly interface and a rich set of APIs help businesses to implement enterprise-grade decentralized solutions and quickly progress from proof of concept to production on their use cases. At Chainstack, we are making it simple and cost-effective for innovative businesses to leverage the potential of decentralization. With interoperability, security [19], analytics, and a host of other advanced features only a click away on the platform, business consortia can accelerate the development of transformative decentralized processes and solutions. It supports multiple protocols such as Fabric, Quorum, Corda, and Ethereum from single dashboard and deployment on public cloud (Azure, AWS, etc.) or on-premise it has intuitive interface and advanced security with detailed access controls and node monitoring.

5.4 HPE (HEWLETT PACKARD) Blockchain-as-a-Service

Enterprise distributed ledger platform that enables users to leverage technical expertise, differentiated architectures, end-to-end delivery, and ecosystem of partners to successfully design, deliver, and run enterprise blockchain applications quickly and easily. It enables customers to execute distributed ledger workloads in environments that demand 100% fault tolerance and high performance platform that scales with business requirements. Provides strong backing and technical support with a dedicated team of blockchain experts and partners. HPE Pointnext provides advisory, professional, and operational blockchain services to help users design and implement solutions, speed adoption, and maintain operational excellence.

5.5 ORACLE BLOCKCHAIN CLOUD SERVICE

Enterprise-grade blockchain cloud platform that enables organizations to build and deploy blockchain applications. Stored data can be accessed in real time for easy auditing and verification. A decentralized blockchain network for B2B transactions and sharing of real-time data. Encouraged innovation through novel business models and opening up opportunities to reach new markets. It consistent

and real-time data storage across all nodes and stored data can only be accessed by authorized users with corresponding keys. This is scalable and highly-secure platform using data-at-rest encryption. Regular ledger backups for point-in-time recovery, in case of any malicious attack. Increased developer efficiency and versatility of applications by implementing REST API and Oracle integration accelerators.

5.6 VeChain

Decentralized blockchain platform offering Blockchain-as-a-Service to enterprises, especially anti-counterfeiting and supply chain management solutions. VeChain offers its solutions for luxury goods, alcohol, agriculture, automotive and other industries. It implements IoT, NFC and RFID technology for improved security and efficient tracking. By leveraging on blockchain technology, VeChain strives to build a trustless and distributed business ecosystem, which is also self-sustaining and scalable. It is decentralized platform enabling transparent transfer and immutable storage of information on the blockchain. End-to-end tracking of products using NFC, IoT and RFID technologies for better lifecycle management. It provides detailed, accurate information on every product on the blockchain to ensure quality is maintained.

6. CONCLUSION

Blockchain is considered and endorsed by the technical world for its decentralized property. It can be applied to a various applications far beyond crypto currency. For transforming the traditional industry, it has proved its efficiency with the help of key attributes like auditability, decentralization, anonymity and persistency. Blockchain has built its faith in the business in a very short period of time and has led to success in many organizations. If we consider the latest business that is open blockchain innovation will enable Nestlé to share vital information with its consumers in an easily accessible way. More importantly, it will increase transparency in their supply-chain. It is not difficult to imagine that with such transparency, the company will improve its relationship with the consumers. In addition, consumers are expecting to learn more about a company that is making their favorite consumable items. The businesses that followed this technology has abled to save money and build a reputation in the new, trusted, digital world.

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