Blockchain based Service: A Case Study on IBM Blockchain Services & Hyperledger Fabric

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ABSTRACT

IBM is one of the world's leading American multinational technology company, always innovative and experimenting for new things with constant new trials and hands on different technologies. The company is recently focused its research and innovation on one of ICCT underlying technology applications called Hyperledger fabric and blockchain. A business blockchain presented by Linux foundation is hyper ledger fabric becoming the de facto standard for enterprise it provides blockchain-as-a-service (BaaS) and lets the usage of blockchain components any possible business environment with ease. Blockchain has several edges, together with decentralization, durability, transparency, and audit ability. The IBM goal is to develop company-ready solutions that address existing technology limitations relating to privacy, confidentiality, audit ability, performance, and measurability. Proven, scalable, and built for running on any cloud Simplifies complexness quickly, unlocks new price, and expands competitive edges. Hyperledger cloth system for companies might be thought to be a public platform. Within which all transactions committed are held on in an exceeding blockchain. The chain grows endlessly as new blocks are added. To figure towards a friction-free network by facilitating easy functionality this article illustrates Blockchain, IBM blockchain, Hyperledger fabric its framework, tools, and blockchain-as-a service. The secondary data was obtained from various scholarly journals and websites. We have analysed the Hyperledger framework, tools and examined their blockchain services to different industries using the ABCD analysis framework as a research case study.

Keywords: Blockchain technology, IBM blockchain, Hyperledger fabric framework and tools, Blockchain-as-a-service, ABCD analysis framework.

1. INTRODUCTION :

Blockchain is a technology under the umbrella of the ICCT. ICCT is an important general-purpose technology that helps to solve basic needs-based problems. Under which Blockchain is also one of the general-purpose technologies developed under the ICCT umbrella [1-4]. By allowing for the distribution but not copying of digital content, Blockchain has become the foundation of a new type of internet. Blockchain is an associate incorruptible distributor of economic transactions that can be configured to monitor not only financial transactions but for anything useful as well. Business growth is primarily responsible for the rise in demand for this product. Blockchain technology functions as an electronic transaction processing and record-keeping device. This allows different individuals who are usually directly linked to the network to track data over a secure network, which eliminates all sorts of third-party confirmations. Blockchain is a decentralized, peer-to-peer ledger network primarily used in the financial sector [5]. Depending on the identity established of users among a network, it's attainable to differentiate between permissioned and permission-less blockchain systems [6]. And a block which is new can be added to the ledger by every user. In comparison, a user's identity is regulated by an identity provider in the case of a permissioned blockchain. The Identification provider is responsible for maintaining network access control and for the user's involvement in consensus, or for validating a

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new block. A distributed blockchain operating system is the fabric for distributed applications in general programming languages & implements distributed applications. traces its execution history safely and does not have crypto-currency-built in and replicated data structure [7]. IBM Blockchain Accelerator helps start-ups develop their blockchain business networks quickly. Distributed ledger and its unchangeable transaction log are accessible to all network participants. Transaction of shared ledger documents only once, thus avoiding duplication of effort that is characteristic of traditional business networks. IBM Blockchain provides ways to enhance process efficiency through the creation of smart workflows and data collection, in particular for data exchange across agencies. Jointly tracked, joint data collection allows legislation like the EU General Data Protection Regulation (GDPR) to be implemented more rapidly. Blockchain is among the top IBM 60 cloud data centres technologies in operation. IBM computer blockchain leader is growing fast, the much-needed big blue case [8]. Enterprises have the advantage of being able to incorporate a number of systems without needing to create a centralized solution and bring a degree of trust between untrusted parties or bring in a trusted third party.

2. RELATED WORK :

Hyperledger Fabric an open-source distributed ledger system announced by the Linux Foundation in December 2015 and has since been developed by IBM for industrial use. works related to Hyperledger fabric have been undertaken by many researchers. Some of the scholarly published papers on the Hyperledger fabric are shown in Table 1 with the contributions made along with the references.

Table 1: Related publications on Hyperledger fabric by different researchers

S. No	Contribution	Reference
1	The Hyperledger Project, which was created in early 2016 as a project of the Linux Foundation, currently has over 250 members.	Cachin, C. (2016) [9]
2	Under the auspices of the Linux Foundation Fabric is used in various industries and applications in more than 400 projects, proof-of-concept and distributed-leader development systems.	Androulaki, E., et al. (2018) [10]
3	Hyperledger Fabric is a platform for organizations to pursue applications. It is built as core design criteria with simplicity and generality and thus embraces a wide array of non-deterministic smart contracts.	Marko Vukolic, (2017) [11]
4	The Hyperledger Network is a permitted blockchain, where it requires some qualifications to write to the ledger. The participants who are allowed to write to the ledger at Hyperledger Fabric are called peers (and typically only a few of them). This system makes the transaction easier to track on the ledger and is usually quicker than the public blockchains used in most cryptocurrencies	Benhamouda, F. et al. (2019) [12]
5	The mechanism used by Hyperledger Fabric to validate transactions and build blocks is PBFT. The transactions are managed using a chaincode (smart contract) in Hyperledger Fabric, which is a programming code that enables the applications to be written and configured to communicate with the network.	Nasir, Q. et al. (2018) [13]
6	Fabric introduces a modern design of blockchain aimed at durability, versatility, scalability, and confidentiality which is Designed as a block-chain allowed for modular and extensible general-purpose.	Sousa, J. et al. (2018) [14]
7	Fabric's definition of consensus is broad and encompasses the entire transaction process, starting	Valenta, M., et al. (2017) [15]

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	with the creation of a transaction on the network to be added to the ledger.	

3. OBJECTIVES OF THE STUDY :

This study is focused on the analysis of top multinational technology company- IBM. The main objectives are:

(1) To study the blockchain service provided by IBM.
(2) To know the hyper ledger fabric usage.
(3) To know how different industries can get benefited after implementing the IBM blockchain.
(4) To analyse IBM Blockchain using ABCD analysis framework.
(5) To find what are the possible challenges faced by IBM implementing Hyperledger fabric.

4. RESEARCH METHODOLOGY :

Secondary data is used for the development of this case study and for the collection of published data sources. This article describes the Blockchain, Hyperledger fabric framework, tools, and blockchain-as-a-service of IBM company.

5. ABOUT IBM BLOCKCHAIN :

A computer tabulating recording company released the 'Blockchain as a service' backed open source hyper ledger fabric in 2015 to keep regulating and shepherding technology around Blockchain for business currently there are as many as 250 businesses that are part of hyper ledger fabric. IBM Blockchain is a cloud service that customers can use to develop and establish stable blockchain networks that make Blockchain networks simpler and construct, deploy and manage. HLF is an open-source associate cooperative initiative formed to promote BCT across the industry. It's a global partnership, hosted by The Linux Foundation, with pioneers in politics, banking, the Internet of Things, supply chain and manufacturing [9] IBM company has 1500 workers functioning on five hundred Blockchain industries. Presently IBM is providing financial services for trade finance, cross border payment, trustworthy digital identity and regulatory reporting including supply chain management food business, and world trade, health care, electronic medical records healthcare payment pre-authorisation, media and entertainment and social goods.

6. HYPERLEDGER FABRIC (HLF) :

HLF is not a company neither a crypto-currency nor a blockchain it's an open-source combined effort formed to advance across in HL has a ledger (chain code), smart contract and system help to manage their transaction. HL is a private and permissioned. all the Hyperledger fabric members have to log in with the help of a valid membership service provider. Fabric consists of many elements, including smart contracts, endorsers, committers, validators, and orders. It is designed to help enterprises scale their blockchain network to provide more than 1000 transactions per second permits several enterprises to make parts of BC. Moreover, the fabric has fewer nodes then a public blockchain to increase efficiency towards excessive data computation. it doesn't have native currency but allows users to define assets from the client-side. fabric permits users to participate in open as well as private interaction [9]. The Hyperledger framework, tools and its usage are listed in table 2.

Table 2: List of Hyperledger framework, tools its usage

S. No	Hyperledger framework	Usage	Hyperledger tools	Usage
1	**BESU**	Ethereum client design for public and private runs on test networks like Rinke by, Ropsten, and Görli also includes consensus algorithms PoW, and PoA (IBFT, IBFT 2.0.	**Quilt**	It is a java involving interledger protocol and makes transfers through any payment network — fiat or crypto.
2	**Burrow**	Single-binary blockchain deployment focussed on the	**caliper**	Blockchain benchmark tool measures

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		ergonomics of usability, speed and developer. It supports smart contracts based on EVM and WASM, and uses the Tendermint algorithm for BFT consensus.		performance with predetermined use cases.
3	**Fabric**	Foundation for developing applications or software's consensus that enables performance at scale while preserving privacy.	**cello**	It is an operational dashboard for blockchain and facilitates and creates BaaS.
4	**Indy**	provides tools, libraries, and reusable components rooted in blockchains so as to ensure interoperable across administrative domains.	**Explorer**	It is a user-friendly web application platform used for accessing, invoking, installing or querying blocks, transactions and related data, network data.
5	**Iroha**	Built to integrate simple architecture, modular, domain-driven C++ design, focus on customer application development and a new, crash resistant consensus algorithm, called YAC, into infrastructure or IoT features.	**Avlon**	Published by Enterprise Ethereum Alliance is an independent implementation with trusted computer specifications by enabling secure movement of blockchain.
6	**Sawtooth**	Offers robust and scalable architecture separating the core system from the application domain, and simplifying smart contracts. Composer This is a series of collaborative tools that create networks of blockchains.	**Composer**	It's a set of collaborative tools that build blockchain networks.

7. BLOCKCHAIN-AS-A-SERVICE (BaaS) :

BaaS It is the next wave of cloud computing apps – it's a combination of blockchain technology and cloud computing model. BaaS enables blockchain deployment to be offshoring to the cloud environment for any business. Nevertheless, businesses will benefit from BaaS as a service and meet their business needs. BaaS is a fairly recent addition to both cloud and blockchain technologies. BaaS may either use Platform-as-a-Service directly or indirectly use Software-as-a-Service. The locus of BaaS in a cloud computing environment can vary, depending on how it is implemented.
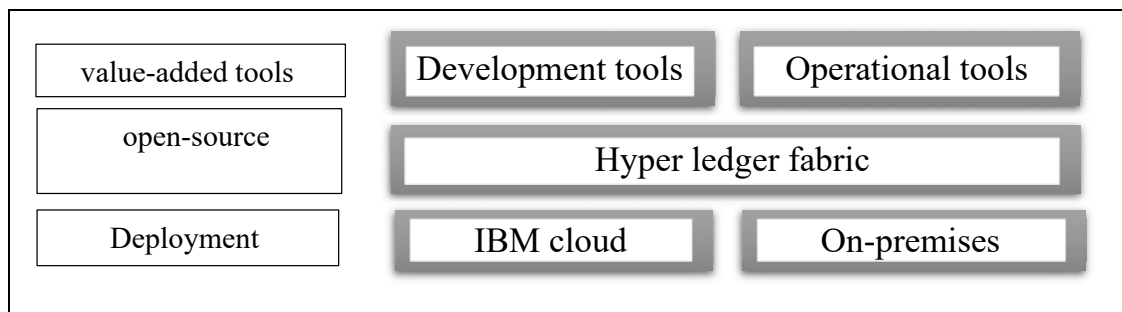

Fig. 1 : Block diagram representing IBM BaaS

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8. ABCD QUALITATIVE ANALYSIS OF IBM BLOCKCHAIN :

ABCD analysis can be used to analyse the advantages, benefits, constraints, and disadvantages of an idea, concept, material, model, strategy, product, or service [16-20]. Since IBM Blockchain is a service, we have qualitatively analysed it by listing its advantages, benefits, constraints, and disadvantages.

(A) Advantages :

(1) Blockchain provides integrity, increases operational efficiency, Lower transaction costs, eliminates process friction and Richer joined up customer experiences in the automobile industry.

(2) IBM Blockchain has a first mover advantage by allowing financial institutions to eliminate frictions and redundancies in real time and to accelerate settlements.

(3) Transforms trade finance by joining us. Trade convened by IBM Blockchain its standardised rules and simplifies trading while decrease risk and increase opportunity for banks and SMEs.

(4) Spreads banking to underserved communities and accelerates the payments in cross borders.

(5) Assist citizens' needs, combat fraud, and help meet compliance requirements through reliable, unchanging records, improve the quality and effectiveness of government records.

(6) Increased standard of treatment, Improve the way communication shifts within the organization with healthcare providers, payers – and most significantly – with the wellbeing of the patient.

(7) Make simpler multi-party service, decreases the complication of multi-party record keeping, eliminates policy, claim, and relationship management costs; streamlines operations and improves insurance for customer satisfaction.

(8) Decrease the necessity for numerous stakeholders in promotion buying and digital content administration, immutable, shared ledger records transactions as they occur, companies in media, advertising, entertainment, and others can have full visibility as it purchases and uses content or data.

(9) Development of trust in invoicing and payment sector, consumer supply chain & international shipping remove complications gets carried away in businesses like soiled management and controlling system.

(B) Benefits :

(1) Improve customer experience — driving competitive differentiation Automate operations — improving capital return productivity and quality Creative goods and services — providing new avenues to currency connected vehicles.

(2) Transaction speed, time reduction, cost & risk of other transactions. Reduce mistakes, improve consumer identification (KYC).

(3) Create a related data recording framework, create authorized documents, ranging from personal identification through registered real estate transactions, advanced smart, automatically generated contracts that support process and corporate flows.

(4) By providing verified consent, electronic data capture, reducing track complexity, Blockchain gives patients control of their own information.

(5) Smart contracts offer a transparent and coherent view of political data and records in real time, simplify the processing of claims, reduce mistakes that lead to better claims management, better control of suppliers and lower operational costs.

(6) Safeguard the copyrights of musical artists, reduce marketing costs and allow content owners to place restrictions on the user access to data.

(7) Offers a common chain of data visibility held between vendors and purchasers, tracks fresh produce through every step of both the supply chain, promotes increased visibility and accountability.

(8) Remove redundant information, enhance visibility and transparency in BC cargo services.

(C) Constraints :

(1) Adapt to the ongoing evolution from traditional ownership models towards mobility-as-a-service.

(2) Regulations complications & restrictions appear as an impassable block for BC implementation.

(3) Capability for trace & track of an object is vital, Precise & open registries are vital for stimulating belief & transparency in government.

(4) Record keeping: clinical study administration creates reams of data that need to be maintained by healthcare administrators.

(5) Heritage, risk-aversion habits, and cultural barriers usually slow down insurance firms 'innovation processes.

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(6) Duplication of records, low data consistency, and manual reconciliation are the key triggers for music ecosystems, antiquated ratings and measuring systems.

(7) Different systems of invoicing and payments, risk.

(8) Handling identification, tickets, and boarding pass, passenger and cargo safety, maintenance events, and operational conditions) persist across all modes of transportation.

(D) Disadvantages :

(1) Lack of information base, Long procedures, Mobile service.

(2) Human error could lead to a huge loss of trust, unavoidable security flaws.

(3) The platforms are varied, their capabilities emerging, and support services around the same are limited, confounds progress.

(4) Lack of mature infrastructure, lack of scalability, the potential for bribery fraud, and unanswered regulatory and legal questions.

(5) Issues of ownership, with confusion and conflict surrounding attribution.

(6) Legal implication, Emerging technology, publicly available data, unclear legal status of smart contracts.

(7) Data modification, Storage, Lack of Transferability, Improper Baggage Tracking, Difficulty in Identification Process, Lack of Payment Security, Over Booking.

9. FINDINGS& SUGGESTIONS BASED ON THE STUDY :

(1) IBM is selling and calling blockchain as Hyperledger fabric by sacrificing the truly important feature of blockchain with more complex architecture than any blockchain platform with also less secure against tampering and attacks which must be handled.

(2) IBM architecture poses growing possible vulnerabilities that require very little malicious coordination. Hence IBM blockchain network architecture needs to be simplified.

(3) IBM blockchain offer usage must be made easier and scalable.

(4) The performance no of IBM Hyperledger fabric claims is misleading. The channels used in Hyperledger are parts of confidential and network secure. hence, the independent evaluation must be eradicated.

(5) IBM struggles to maximize the transaction processing system but with the plurality of sensing elements, this component can be achieved.

(6) For any blockchain decentralized consensus mechanism plays an important role but, IBM suggests using an ordering service called 'Kafta' which doesn't explain how participants tempers with the ledger instead by using enforced, democratized cryptographically secure voting this loophole can be filled.

10. CONCLUSION :

Blockchain has demonstrated the potential to transform the industries with features ranging from Decentralisation, sustainability, transparency and immutability. with this study, we outline to know Blockchain, IBM Blockchain and Hyperledger technology. Organizations may record their transactions directly in a shared ledger with the blockchain, which establishes a chain of accounting records. With each transaction checked and a part of the blockchain, it would be almost impossible to change or counterfeit the reported accounting details and much more. Furthermore, we analysed blockchain technology used by IBM by listing advantages, benefits, constraints, and disadvantages (ABCD listing). Blockchain based applications are gearing up in future we would like to conduct a deep investigation on blockchain applications.

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