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Decentralization using Blockchain as a Service

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Abstract: ***Due to its immutability, traceability, anonymity, and transparency as a decentralised distributed ledger, blockchain has seen significant development in cryptocurrencies and production as a new trend. The emergence of Blockchain-as-a-Service (BaaS) in the interim aids in the mitigation of the Blockchain system complexity and management challenges make it simpler for developers to concentrate on implementing business logic. However, the majority of current BaaS solutions are hosted by cloud providers, increasing the risk of vendor lock-in and undermining blockchain's intrinsic trustlessness. Although current BaaS systems use edge computing or the cloud as their infrastructure, their availability is constrained by the availability of network connections and the data centre itself.***

Most developers or teams find it challenging and expensive to create, maintain, and watch over a blockchain network that supports their apps due to the intricacy of blockchain technology. The majority of regular developers or teams are unable to guarantee the dependability and security of the blockchain system, which in part lowers the calibre of their programmes. The BaaS platform we create in this study,BaaS, offers blockchain services across cloud computing environments, including network deployment and system monitoring, smart contract analysis, and testing. Based on these services, developers don't have to worry about maintaining and monitoring the system and can instead concentrate on the business code to investigate how to apply blockchain technology to their business scenarios more effectively.

Keywords: blockchain, decentralization, edge-computing.

I. INTRODUCTION TO BLOCKCHAIN AS A SERVICE

A BaaS platform can use the deployment and management advantages of cloud service infrastructure by integrating the blockchain framework into the cloud computing platform to offer developers quick, high-performance blockchain ecosystems and related services. Developers can quickly launch a blockchain network to support their application through these fundamental cloud services, ignoring the intricate underlying architecture.

Despite the numerous advantages of blockchain, its complexity and challenging maintenance have prohibited programmers from focusing on the use of blockchain or even their business logic. Blockchain-as-a-Service (BaaS), a new infrastructure that makes it easier to build, manage, and maintain blockchains, has been developed to address these issues. Amazon AWS BaaS, Microsoft Azure BaaS, Oracle BaaS, and other tech behemoths all have their own BaaS systems. [2] Additionally, there are open-source BaaS initiatives like BlockForm.

However, there are still issues with the current BaaS platforms that need to be fixed. BaaS provides an integrated blockchain framework to make blockchain implementation simple, for starters. For instance, vendor lock-in risk [3, new trust issues with presumed-reliable BaaS providers, and the cloud-storage of blockchain data have all been associated with BaaS platforms. Data localization is a task that BaaS may do but is not simple.

A. Aim

The aim is to Show the highly accessible blockchain system's architecture comparing the performance of this system to the original on-premises blockchain system.

Project objectives:

1) A new architecture called Blockchain-as-a-Service (BaaS) has been proposed in order to make blockchain deployment, monitoring, and maintenance easier.
2) Providing BaaS as an integrated blockchain framework to make the deployment of blockchains simpler.

B. Motivation

1) BaaS is a more efficient way to build a full-fledged blockchain system.
2) Better privacy and decentralisation of a blockchain system can be achieved by storing block data on-premises.

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3) When used as a disaster recovery plan, it is extremely advantageous to deploy three data centres in two cities.
4) I have a personal interest in cloud-computing and also blockchain is having a lot of scope in the future.

II. SCOPE OF BLOCKCHAIN AS A SERVICE

We intend to investigate the viability of extending the cloud control plane's functionality to the edge in the future so that a company can join a reputable consortium blockchain in the event that the cloud-edge link is lost and the BaaS system can benefit from improved decentralisation.

A. *Features*

1) BaaS offers a more efficient way to develop a complete blockchain system with enhanced privacy and decentralisation.
2) A blockchain system can be made more private and decentralised by localising the block data on-site.
3) Businesses now have an option for implementing their blockchain platforms, in addition to cloud-only or wholly on-premises deployments, thanks to the expansion of BaaS to the edge. Without having to rely on a cloud provider as much, they can even deploy their blockchain system using opensource BaaS software.
4) Blockchain ledger data is kept on distributed edge data centres by extending BaaS there with the right configuration, which gives the blockchain system more availability and dependability and prevents a single point of failure in a single cloud. The placement of three data centres in two cities as a disaster recovery plan is very advantageous.

B. *Advantages*

1) Blockchain adopters can enjoy seamless service with far lower costs than real installation thanks to already established cloud platforms.
2) Several rules and norms, including as node verification, node attachment, node deletion, and forking, must be adhered to under the current blockchain architecture. BaaS, however, can take care of them without any assistance.
3) Beyond cryptocurrencies, blockchain technology is applied in other applications. As a result, there has been a significant growth in contact with other platforms, services, and infrastructure in recent years. PaaS, IaaS, SaaS, and comparable other parts of the cloud remain native to BaaS since BaaS blockchain technology is constructed using existing cloud architecture, allowing a better degree of interoperability.
4) Current blockchain implementation calls for a moderate level of expertise in distributed technology and cryptography.

C. *Risk Factors*

1) In a conventional BaaS system, blockchain data is typically kept in the cloud of the service provider, which violates the inherent trustlessness of the blockchain and assumes the cloud provider to be a reliable third party
2) If suitable measures aren't taken, cloud migration might not be cost-effective
3) The BaaS platform's viability for resolving practical issues.
4) The BaaS platform's scalability can accommodate a growing number of hosts (nodes).
5) A BaaS platform's ability to receive community support.
6) The BaaS platform's viability in terms of coding or modification.
7) Flexibility with currently available technology.
8) A BaaS platform's accessibility (public, private, or consortium).
9) The safety and privacy of a platform for BaaS.

III. METHODOLOGY

The current state of BaaS is examined in this article in terms of technological advancement, applications, market potentials, and other factors. The adoption trajectory, difficulties, and risk factors have all been discussed together with an evaluation of the major BaaS platforms. The report also advises standardising the BaaS platforms that are currently accessible.

The site of BaaS in a cloud computing environment may change depending on how it is deployed. Shows where BaaS is located in an on-premise local deployment. In such deployments, SaaS and PaaS work together to support BaaS.

BaaS receives infrastructural support from PaaS whereas SaaS provides the technical services (software). Implementing a blockchain on-site is very expensive.

Users of such local implementations must contribute a sizeable portion of capital expenditures (CapEx) to maintaining the DLT's performance and infrastructure. BaaS is an alternate economic strategy that allows users to fully utilise blockchain technology while investing less. BaaS is capable of handling all aspects of blockchain management, including consensus, forking, node validity, commodity exchange, backup, off-chain, and on-chain synchronisation.

IV. ENHANCEMENT

1) The suggested strategy sends three duplicates of each blockchain node to several peripheral data centers in order to increase availability, which is unnecessary if single data centre collapse is not an issue. As a result, the edge zones in the RBaaS system might simply be various components of a single data centre, like racks.
2) The proposed model, which allows virtual synchronous replication, makes use of MariaDB Galera.
3) The speed of virtually synchronous replication is nonetheless considerably impacted compared to asynchronous replication, although typically being faster than conventional synchronous database replication. The database might theoretically use asynchronous replication because there is only one leader among the three replicas of a blockchain node.
4) However, additional adjustments are required to support automatic recovery and ensure data consistency.

V. CONCLUSION

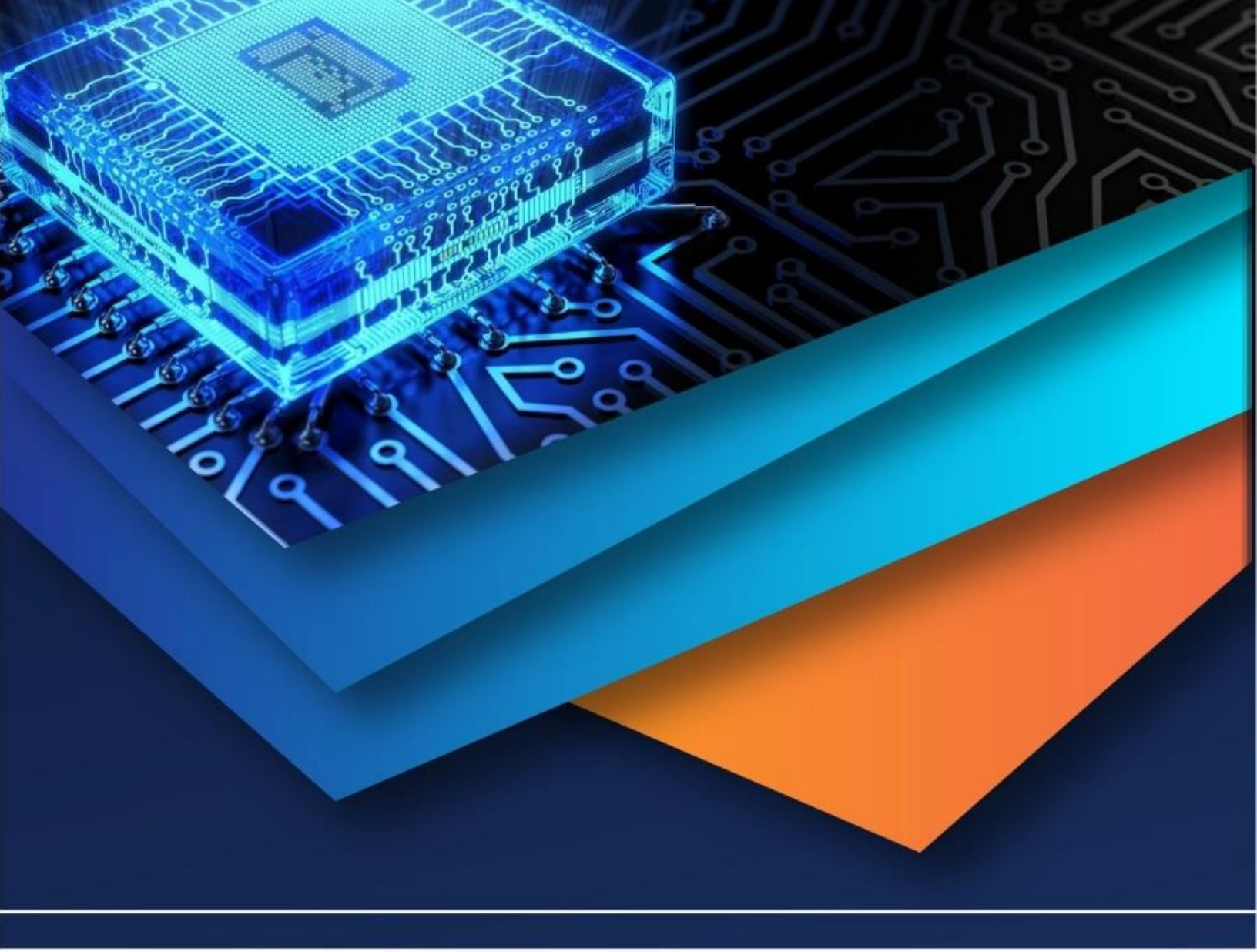
In order to extend blockchain deployment to the on-premises edge or private cloud with management capacity from the public cloud, this article offers a cloud-edge collaborative BaaS paradigm (RBaaS) for a cloud-edge collaborative environment. The RBaaS platform may operate in an edge autonomy scenario with cross-data-center high availability and management simplification by combining Kubernetes with Openyurt, redundant blockchain nodes, leader election, and edge network self-healing implementation. Blockchain as a Service (RBaaS) can advance trustworthiness and privacy by localising blockchain storage. According to the performance results, the suggested RBaaS has a respectable throughput at rates of modest transaction sending.

We intend to investigate whether it's possible to expand the cloud control plane's functionality to the edge in the future so that a company can join an established consortium blockchain.

The BaaS system can become more decentralised when the cloud-edge connection is lost.

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