Role of Block Chain in Cloud Computing

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Abstract:
Through virtualization and resource integration, cloud computing has expanded its service scope and offers a better user experience than traditional platforms, along with its business operating model that brings tremendous economic benefits, and "cloud computing is a practice of using a remote network server running in the Internet hosted to store, manage and process data instead of a local server or PC." Blockchain properties like decentralization, transparency and security have made it a very important and revolutionary technology for the current generation of various industrial applications. One such field is cloud computing, blockchain is a distributed ledger with records containing all the details of transactions performed, distributed among the nodes present in the network. Blockchain technology has evolved in recent years as a game changer for various industry sectors, from Fin Tech and supply chain to healthcare and education, enabling them to meet competitive market demands and end-user demands. Blockchain is the necessary technology behind Bitcoin, a popular digital crypto currency. Blockchain is also used in many crypto currencies. Blockchain technology gained popularity after the massive success of Bitcoin. We tend to research a brief survey of a previous research paper that focused on blockchain- cloud integration to show its supremacy. In this document, we have discussed some of the most important cloud problems and proposed solutions based on blockchain technology integration.

Keywords: Cloud computing, Blockchain technology, Crypto currency, Service, Bitcoin.

1. INTRODUCTION:

In simplest terms, cloud computing is the delivery of computing services, including servers, storage, databases, networks, software, analytics, and information, over the Internet ("the cloud") to enable faster innovation, flexible resources, and economies of scale. You typically only pay for the cloud services you use, which helps lower your operational costs, run your infrastructure more efficiently, and scale as your business needs change. Cloud-based storage allows files to be stored in a remote database and retrieved when needed [1]. There are many benefits such as reduced hardware and maintenance costs, worldwide availability, flexibility with a highly automated process, and easy scalability. Many large companies have adopted IBM, Google, Amazon and Microsoft as cloud. Cloud computing certainly has several advantages, but there are also some security issues with cloud computing [1, 2].

Below are some of the following cloud computing security issues.

- **Data Loss:** Data loss is one of the problems in cloud computing. This is also known as a data leak.
- **Lack of transparency:** Without knowing the internal operating mechanisms, cloud computing is like a black box for its users
- **User Account Hijacking:** Account takeover is the most serious security issue in cloud computing. When a hacker somehow hijacks a user or organization's account or many more. To fuel the growth of cloud computing, we can overcome privacy and data security concerns by incorporating blockchain technology. It improves data security, service availability and can manage data in the cloud. Blockchain is a distributed ledger that stores tamper-proof data in the form of a chain without a central instance [3, 4]. Devices participating in blockchain technology are called nodes. With the blockchain, all nodes in the network participate in the validation and verification of data in a decentralized way. In this article, Section II introduces you to cloud computing concepts. Section III explains blockchain technology, its features, blockchain types, blockchain layers, and architecture. Section IV discusses the benefits of integrating the cloud with the

blockchain technology, with the proposed architecture.

2. Cloud computing concepts:

Cloud computing relies on resource sharing for consistency and typically uses a pay-as-you-go model, which can help reduce capital expenditures but also unexpected costs for users can cause. In the modern Internet age, there are millions of websites on the Internet. The presented site requires a large number of servers, which is very expensive. Traffic rates from these servers must be constant and must be checked and maintained regularly. More employees need to be hired People who organize and maintain these servers [4, 5]. All information is stored in data centers. As a result, continued attempts to keep the server and employees safe from problems may impact our ability to achieve our business goals. We use "cloud computing" to avoid this time- consuming maintenance." Cloud computing is the practice of storing, managing and processing data from anywhere in the world through a network of remote servers. It replaces a local server or PC." Cloud computing services such as data storage and application delivery are delivered to enterprise devices over the Internet. Advocating "everything as a service" (stands for EaaS or XaaS or simple ASS), cloud computing providers offer their "services" according to different models, of which the three standard models are Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS).

2.1 Infrastructure as a Service (IaaS):

IaaS is also known as Hardware as a Service (HaaS). It is one of the layers of the cloud computing platform. It allows customers to offload their IT infrastructures such as servers, networks, processing, storage, virtual machines and other resources. Customers access these Internet resources on a pay-as-you-go model. IaaS is offered in three models: public, private and hybrid cloud. Private cloud means that the infrastructure is at the customer's Premises.

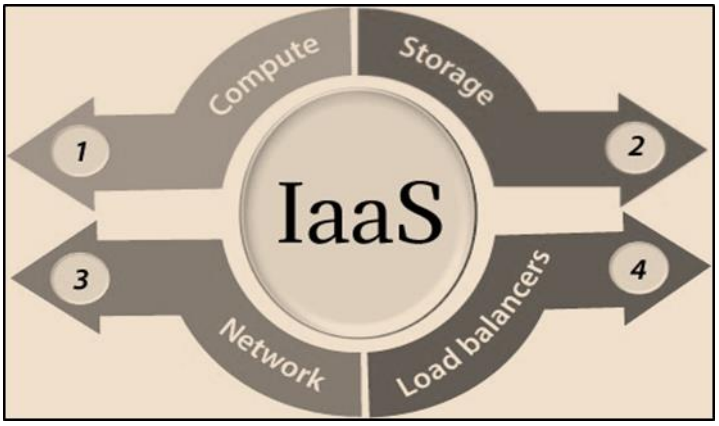

Fig.1: Architecture of IaaS

2.2 Platform as a Service (PaaS):

Platform as a Service (PaaS) provides a runtime environment. It allows developers to easily build, test, run and deploy web applications. PaaS providers provide the programming languages, application frameworks, databases and other tools.

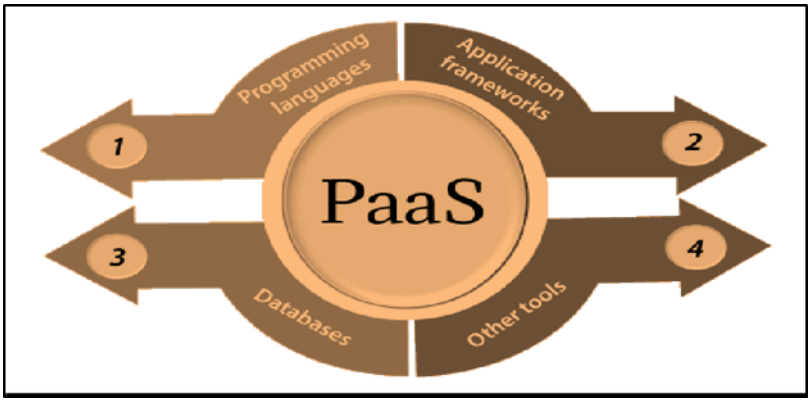

Fig.2: Architecture of PaaS

2.3 Software as a Service (SaaS):

Software as a Service (SaaS) is a software distribution model in which a cloud provider hosts applications and makes them available to end users over the Internet. In this model, an independent software vendor (ISV) can contract with an external cloud provider to host the application. Or for larger companies like Microsoft, the cloud provider can also be the software provider. SaaS is also referred to as "Software on Demand". It is a software distribution model where services are hosted by a cloud service provider.

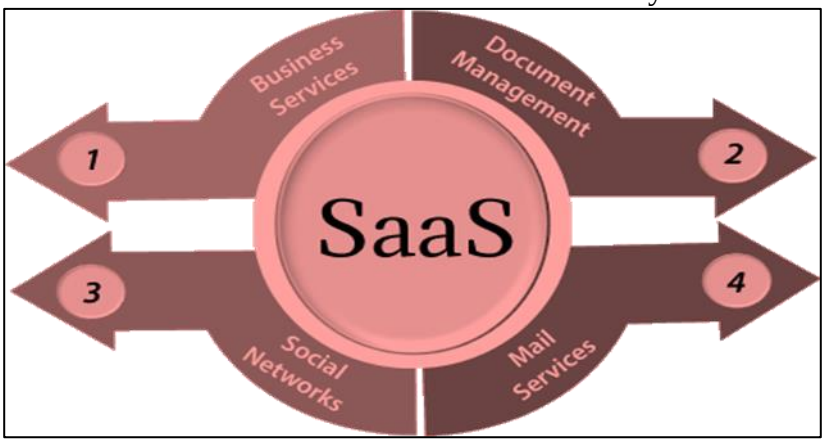

Fig.3: Architecture of SaaS

3. Deployment models in cloud computing:

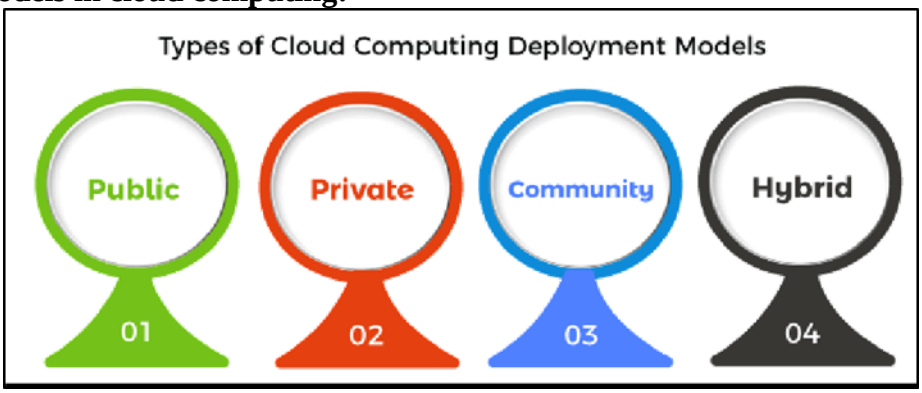

Fig.4: Types of cloud deployment models

3.1 Public Cloud:

Cloud services are considered “public” when they are delivered over the public internet and can be offered as a free or paid subscription. Architecturally, there are few differences between the public cloud and the private cloud. Services, but security concerns increase significantly when services (applications, storage, and other resources) are shared among multiple clients.

3.2 Private Cloud:

Private cloud is a cloud infrastructure operated solely by a single organization, whether hosted internally or externally. Executing a private cloud project requires a significant commitment to virtualizing the business environment and requires the organization to re-evaluate existing resource decisions.

3.3 Community Cloud:

The Community Cloud shares infrastructure between multiple organizations in a specific community with common concerns (security, compliance, jurisdiction, etc.), whether managed internally or by a third party, and hosted internally or externally.

3.4 Hybrid Cloud:

The hybrid cloud is a combination of a public cloud and a private environment such as a private cloud or on-premises resources, which are still separate entities but are interconnected and offer the benefits of multiple deployment models. Hybrid cloud can also mean the ability to connect colocation, managed and/or

dedicated services to cloud resources.

4. Research Issues in Cloud

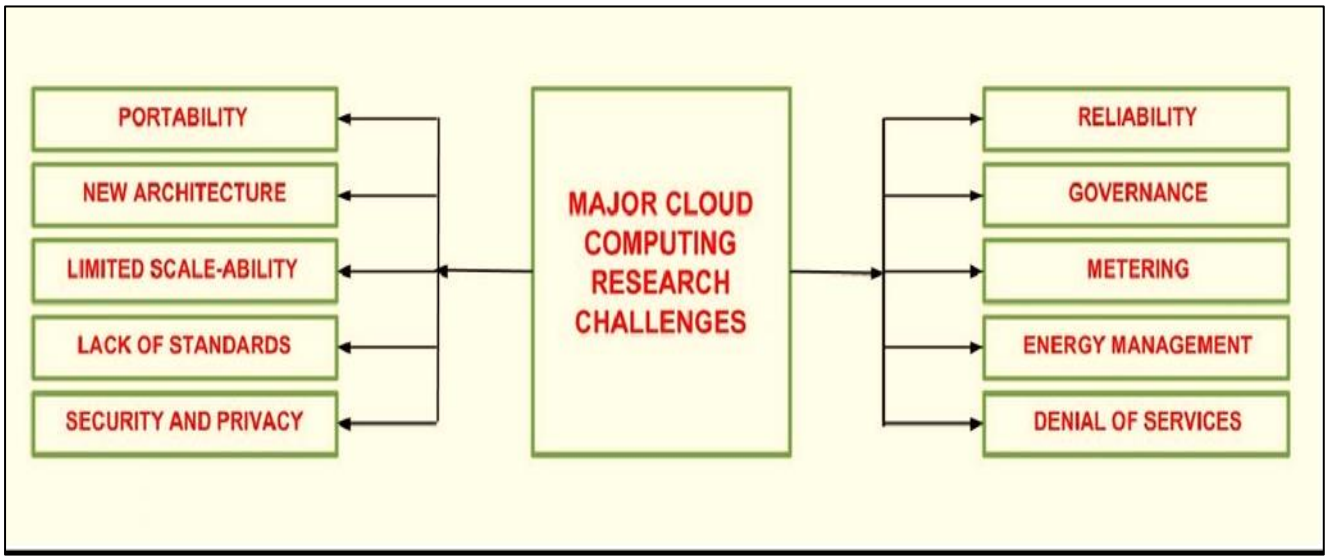

Fig. 5: Major challenges in cloud computing

4.1Portability:

Portability is the ability to move the application and its data from one place to another. This can be achieved by limiting dependencies on the underlying atmosphere. A portable component (application, data) can be moved and reprocessed independently of the vendor. , platform, operating system, location, storage, etc.

4.2 Development of a new architecture:

Today almost all cloud computing services are used in large commercial data centers and run centrally. This design approach has its advantages, namely economies of scale and high manageability, but it has some limitations. Most researchers tend to use the provided resources to host applications in the cloud.

4.3 Limited Scalability:

Cloud computing service providers promise to offer customers infinite scalability, but with millions of users now migrating to cloud computing, that promise isn't being fulfilled. The challenge of availability and scalability presents another area of investigation for the researcher to find an optimal solution to these problems.

5. Blockchain Technology

5.1 Blockchain:

A blockchain is a distributed database or ledger shared among nodes on a computer network. Like a database, a blockchain stores information electronically in a digital format. A key difference between a typical database and a blockchain is how the data is stored structured. A blockchain collects information in groups called blocks, which contain sets of information [6, 7]. Blocks have specific storage capacities, and when they are full, they are closed and linked to the previously filled block, creating a data chain known as a blockchain. Any new information following this newly added block is compiled into a newly formed block, which is then also added to the chain once it is complete.

5.2 Working of blockchain:

A blockchain is "a distributed database that maintains an ever-growing list of ordered records called blocks". These blocks “are linked using cryptography. Each block contains a cryptographic hash of the previous block, a timestamp, and transaction data can be retrospectively modified without having to change all subsequent blocks and the network's consensus.”

Transaction Process

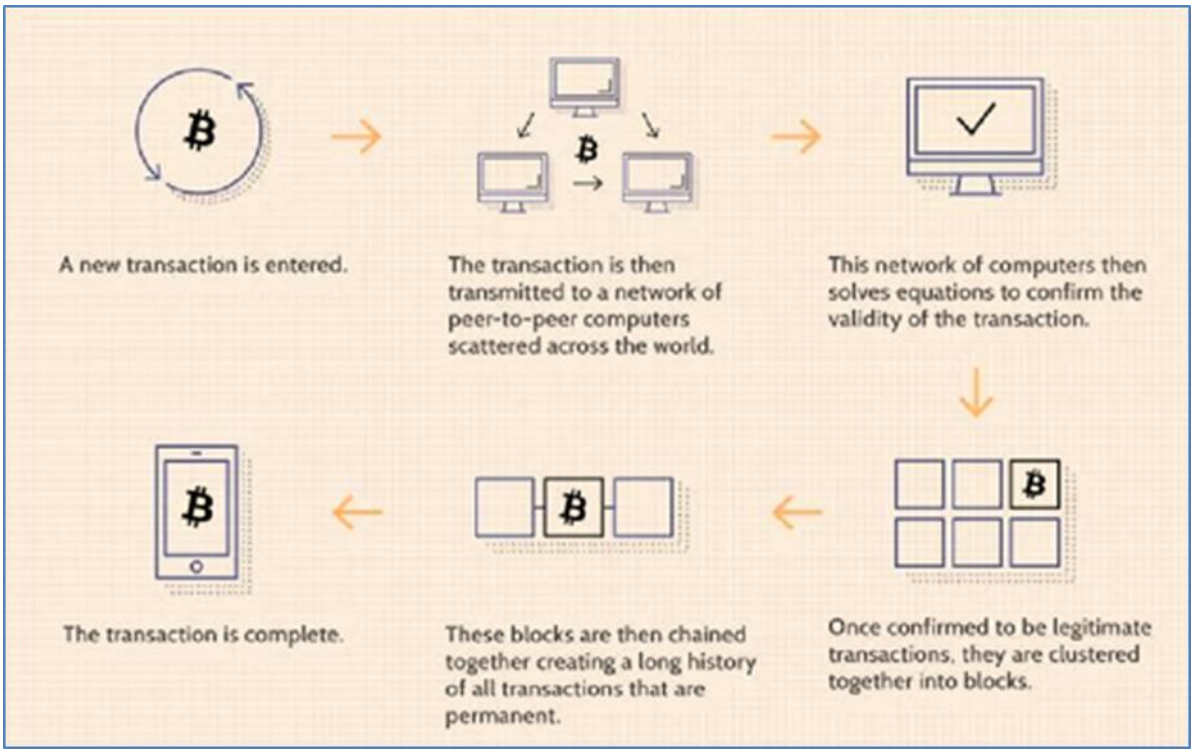

Fig. 6: Working of blockchain

6. Characteristics and Functionalities:

6.1 Blockchain decentralization:

In a traditional centralized network, nodes must be validated by a trusted centralized server. This approach introduces a problem of communication delay throughout the system and increases computational costs. -Peer blocks without the need for third party involvement. This means the blockchain does not have to rely on a central server to store and update multiple systems.

6.2 Persistence:

All transactions are verified on the blockchain and transaction data is stored by honest miners. When the transactions are listed, it is difficult to undo or delete the transactions. In addition, these blocks are also validated by other miners, so they cannot be tampered with.

6.3 Verifiability:

All transactions on the blockchain are digitally signed by the sender, storing the block with a timestamp, making it easier for users to track and verify transaction information.

7. TYPES OF BLOCKCHAIN

7.1 Public blockchain:

Simply put, publicly accessible blockchains are called public blockchains. These blockchains have no participation and validator restrictions. The main advantage of this type of blockchain is the uncontrollability of the blockchain, which means that nobody has complete control over the network.

7.2 Private blockchain:

As the name suggests, this particular blockchain requires participants to be invited before they can become part of the blockchain. Here, all transactions are only visible to people who are part of the blockchain ecosystem. These types of blockchains are centralized and much better controlled than public blockchains.

7.3 Consortium/Hybrid Blockchain:

This blockchain is divided into two different types where some nodes are private while other nodes are public. As a result, some of the nodes can participate in the transactions. The other nodes control the consensus process. This is a hybrid blockchain between public and private blockchains.

8. INTEGRATION OF CLOUD AND BLOCKCHAIN

8.1 block chain support for cloud computing:

Cloud computing must always keep performance management in mind. And the blockchain system is one of the most functional systems. Because blockchain is a decentralized system, it can also support cloud computing architecture. This means that computers and devices can work simultaneously for specific data storage or processing tasks [8, 9]. This, in turn, effectively helps reduce the total time of reliable operations and improves completion speed. Blockchain integration with cloud computing ushers us into the next era of data security and service availability. Blockchain overcomes most cloud research problems with its features.

8.1.1 Interoperability:

Internal communication between systems is critical for sharing and utilizing information. Public cloud networks are built as closed systems and are not designed to communicate with each other. The industry cannot bring their IT systems together in the cloud due to the lack of internal communication between the cloud systems. Businesses need to take the initiative. to create a single toolset to integrate multiple applications across existing programs and cloud providers.

8.1.2 Data Encryption:

To ensure data security, data is encrypted. Several security levels are available, including low, medium and high. Consider web service APIs that can be used to access the cloud via a computer application or clients written for those APIs. For access, we use SSL encryption, which is widely used as a standard. When the object is sent to the cloud, the data is decrypted and stored there. While the data is decrypted and stored without prior encryption before being stored on the Cloud, data security is at risk.

8.1.3 Service Level Agreements:

Cloud services are provided in accordance with Service Level Agreements, allowing multiple instances of the same application to be replicated to multiple servers as needed, based on priority. If this program has a lower priority, the cloud can disable or minimize it. The most difficult task for cloud users is evaluating service level agreements with cloud providers. Most providers draft service-level agreements that favor them while providing users with a minimum of services, such as: B. Data protection, downtime and pricing structures. Before negotiating a contract with a provider, cloud customers should approach these issues with extreme caution.

8.1.4 Analytical survey on blockchain cloud:

Based on blockchain-compatible cloud computing, we can find various articles. To the best of our knowledge and belief, we have conducted a literature search on Blockchain Cloud for the first time.

8.1.5 Impact Areas of Blockchain in Cloud Computing:

Cloud computing is one of the most important complementary technologies supporting the creation and operation of blockchains. Some of the outstanding benefits of blockchain and cloud integration have been discussed in the previous section. In this section, we examine the key areas of the cloud. Computing that has undergone significant changes through integration with blockchain technology. "Security", "privacy" and "storage" are areas of cloud computing that have made numerous advances since their integration into the cloud. Discusses bibliometric analysis for the three domains and identifies researchers' interests through publication patterns. Additionally, he has recognized that overcoming security and privacy hurdles is imperative for the growth of cloud computing to make blockchain seem like a perfect match. Summarizes some of the outstanding work for the mentioned areas. Data security and user privacy are the top concerns when adopting the cloud. Blockchain integration in the cloud has potential to mitigate security and privacy issues [10, 11]. Distributing large amounts of data in a blockchain cloud environment improves accuracy and minimizes costs. In addition, advanced access control mechanisms can be implemented in a cloud environment through blockchain integration. As most cloud organizations follow a centralized access control mechanism, integration with blockchain will bring decentralization and prevent data tampering or data leakage by internal cloud administrators. Cloud auditing is another area where privacy is of paramount importance as it involves tracking and recording of all operations and their relevant data. .The decentralized nature of the blockchain will make it easier to secure the provenance of the data and the information about the data's owners, solving one of the main problems of cloud storage applications [7-10].

CONCLUSION

Cloud computing is a technology that has been known for many years. But people are still struggling

to overcome some cloud computing challenges like data security, data management, interoperability, etc. Integrating blockchain with cloud computing brings many benefits in terms of usability, trust, security, scalability, data governance, and many other benefits. This document provides a review and investigation of blockchain in cloud computing systems. The advantages of integrating the cloud with the blockchain technology is also discussed.

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