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# Blockchain Enabled Secure Data Sharing and Authentication Mechanisms for Cloud Computing Platforms

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**ABSTRACT:** Cloud computing has become a foundational technology for modern digital services, enabling scalable storage, on-demand computing, and global data accessibility. However, traditional cloud platforms face persistent challenges related to data security, trust management, authentication, and secure data sharing among multiple users and organizations. Centralized cloud architectures are vulnerable to data breaches, unauthorized access, insider attacks, and single points of failure. To address these issues, blockchain technology has emerged as a promising solution due to its decentralized, immutable, and transparent nature.This research proposes a blockchain-enabled secure data sharing and authentication framework for cloud computing platforms. The framework integrates blockchain smart contracts, cryptographic authentication mechanisms, and distributed ledger technology to ensure secure, transparent, and tamper-resistant cloud operations. It enables decentralized identity management, secure user authentication, and controlled access to shared data without relying on a single trusted authority. The system also incorporates encryption techniques and hash-based verification to ensure data integrity and confidentiality during storage and transmission.The proposed architecture enhances trust among cloud participants by maintaining immutable transaction records and enforcing automated access control policies through smart contracts. Experimental analysis demonstrates improved security, reduced unauthorized access, and enhanced data integrity compared to traditional cloud security models. The study highlights the potential of blockchain technology in strengthening cloud computing security and enabling secure, decentralized data sharing ecosystems.

**KEYWORDS:** Blockchain, cloud computing security, data sharing, authentication mechanisms, smart contracts, decentralized identity, cryptography, distributed ledger technology, access control, data integrity, secure cloud storage, encryption, consensus mechanisms, privacy preservation, cybersecurity

## I. INTRODUCTION

Cloud computing has revolutionized the digital landscape by providing scalable, flexible, and cost-efficient computing resources over the internet. Organizations across various sectors, including healthcare, finance, education, government, and enterprise IT, increasingly rely on cloud platforms for data storage, processing, and application deployment. Cloud computing eliminates the need for maintaining expensive physical infrastructure by offering on-demand services such as Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS). This paradigm shift has significantly improved operational efficiency and accessibility to advanced computing resources.Despite its numerous advantages, cloud computing introduces several critical security challenges, particularly in the areas of data sharing, authentication, and trust management. Since cloud services are typically hosted and managed by third-party providers, users must rely on external entities to store and manage their sensitive data. This dependency raises concerns regarding data confidentiality, integrity, and availability. Users often lack full control over their data, making cloud environments vulnerable to unauthorized access, data breaches, insider threats, and cyberattacks.One of the most significant challenges in cloud computing is secure data sharing among multiple users and organizations. In collaborative environments, data must be shared dynamically while ensuring that only authorized users can access specific resources. Traditional access control mechanisms such as role-based access control (RBAC) and attribute-based access control (ABAC) are widely used in cloud systems. However, these centralized models are susceptible to single points of failure and administrative misuse. Additionally, managing trust relationships across multiple cloud service providers becomes increasingly complex in distributed environments.Authentication is another critical component of cloud security. Authentication ensures that only legitimate users can access cloud resources. Traditional authentication mechanisms rely on centralized identity providers, passwords, and token-based systems. However, these methods are vulnerable to phishing attacks, credential theft, replay attacks, and identity spoofing. As cloud ecosystems become more distributed and multi-tenant in nature, there is a growing need for decentralized and tamper-proof

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authentication mechanisms.Blockchain technology has emerged as a transformative solution to address these challenges. Originally developed as the underlying technology for cryptocurrencies such as Bitcoin, blockchain is a distributed ledger system that maintains a continuously growing list of records called blocks. Each block is cryptographically linked to the previous block, forming an immutable chain of records. The decentralized nature of blockchain eliminates the need for a central authority, thereby enhancing trust, transparency, and security in digital systems.

In cloud computing environments, blockchain can be used to enhance data security by providing decentralized authentication, secure data sharing, and tamper-proof audit trails. Smart contracts, which are self-executing programs stored on the blockchain, enable automated enforcement of access control policies without human intervention. This ensures that data sharing operations are executed only when predefined conditions are met.Blockchain-based authentication mechanisms provide decentralized identity management, where user identities are verified using cryptographic keys rather than centralized databases. This reduces the risk of identity theft and unauthorized access. Furthermore, blockchain ensures data integrity by maintaining immutable records of all transactions and data access events.The integration of blockchain with cloud computing creates a hybrid architecture known as blockchain-enabled cloud computing. This architecture combines the scalability of cloud platforms with the security and transparency of blockchain technology. It enables secure multi-party data sharing, decentralized storage verification, and trustless authentication mechanisms.Another important aspect of blockchain in cloud computing is data provenance. Data provenance refers to the ability to track the origin and history of data throughout its lifecycle. Blockchain provides an immutable record of data creation, modification, and access events, ensuring transparency and accountability in cloud environments. This is particularly important in sectors such as healthcare and finance, where data integrity and auditability are critical.Despite its advantages, integrating blockchain with cloud computing also introduces challenges such as scalability limitations, latency issues, and high computational overhead. Blockchain networks often require consensus mechanisms such as Proof of Work or Proof of Stake, which can be resource-intensive. Additionally, storing large volumes of data directly on the blockchain is inefficient, leading to hybrid storage approaches where actual data is stored off-chain while metadata is stored on-chain.Security and privacy concerns also arise in blockchain-based cloud systems. Although blockchain provides transparency, it may expose transaction metadata that can be analyzed to infer user behavior. Therefore, privacy-preserving techniques such as zero-knowledge proofs and encryption are often integrated into blockchain-based cloud frameworks.

The increasing adoption of Internet of Things (IoT), artificial intelligence, and big data analytics further amplifies the need for secure cloud environments. These technologies generate massive amounts of sensitive data that must be securely stored and shared across distributed systems. Blockchain provides a promising foundation for managing such complex data ecosystems securely.This research aims to develop a blockchain-enabled secure data sharing and authentication framework for cloud computing platforms. The proposed system integrates decentralized identity management, smart contract-based access control, and cryptographic security mechanisms to ensure secure and efficient cloud operations. The framework is designed to eliminate reliance on centralized authorities while enhancing data security and trust among users.The significance of this study lies in its potential to improve cloud security infrastructure by introducing decentralized trust models. By leveraging blockchain technology, cloud platforms can achieve higher levels of transparency, security, and reliability. The proposed system can be applied to various domains including enterprise cloud storage, healthcare data sharing, financial systems, and government services.The structure of this study includes a comprehensive literature review of existing blockchain-based cloud security approaches, followed by a detailed research methodology describing the proposed framework. Experimental analysis evaluates system performance in terms of security, efficiency, and scalability. Finally, conclusions and future research directions are presented.

## II. LITERATURE REVIEW

The integration of blockchain technology with cloud computing has gained significant attention in recent years due to its potential to address critical security challenges. Early cloud computing models relied heavily on centralized architectures, where a single cloud service provider managed data storage, access control, and authentication. While these systems offered scalability and convenience, they also introduced vulnerabilities such as single points of failure, data breaches, and lack of transparency.Researchers initially focused on improving cloud security using cryptographic techniques such as encryption, digital signatures, and secure key management. However, these methods alone were insufficient to address trust issues in multi-tenant cloud environments. As a result, blockchain technology emerged as a decentralized alternative for enhancing cloud security.Nakamoto's introduction of Bitcoin in 2008 laid the foundation

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for blockchain technology. Blockchain's decentralized ledger system ensures that all transactions are recorded in a tamper-proof and transparent manner. Each block contains a cryptographic hash of the previous block, making it extremely difficult to alter historical data. This property makes blockchain highly suitable for secure cloud applications. Researchers such as Zyskind et al. proposed blockchain-based personal data management systems where users retain full control over their data using decentralized identity mechanisms. These systems eliminate the need for centralized identity providers and enhance user privacy.Li et al. introduced blockchain-based access control frameworks for cloud storage systems. Their approach used smart contracts to enforce access policies dynamically. Users could request data access, and smart contracts automatically verified permissions before granting access. This significantly reduced administrative overhead and improved security.

Another important contribution is the use of blockchain for secure data sharing in healthcare systems. Healthcare data is highly sensitive and requires strict privacy protection. Researchers developed blockchain-based medical record systems that allow patients to control access to their health data while ensuring transparency and auditability.In the context of authentication, blockchain-based decentralized identity management systems have been widely studied. These systems replace traditional username-password authentication with cryptographic key pairs. Users authenticate themselves using digital signatures, reducing the risk of credential theft and phishing attacks.Smart contracts play a crucial role in blockchain-enabled cloud systems. They are self-executing programs that automatically enforce predefined rules. Researchers have used smart contracts for automated billing, access control, and data sharing agreements in cloud environments.Despite these advancements, scalability remains a major challenge in blockchain-based cloud systems. Public blockchains such as Bitcoin and Ethereum suffer from limited transaction throughput and high latency. This makes them unsuitable for large-scale cloud applications. To address this issue, researchers have explored hybrid blockchain models and off-chain storage solutions.Privacy concerns also persist in blockchain systems. Although data stored on the blockchain is encrypted, transaction metadata may still reveal user behavior patterns. Techniques such as zero-knowledge proofs and ring signatures have been proposed to enhance privacy.Interoperability between blockchain and cloud platforms is another research challenge. Integrating decentralized blockchain networks with centralized cloud infrastructures requires efficient communication protocols and standardized APIs.

Recent studies have explored the use of consortium blockchains for cloud computing, where a group of trusted organizations collectively manage the blockchain network. This approach improves scalability and reduces computational overhead compared to public blockchains.Overall, the literature indicates that blockchain technology has significant potential to enhance cloud computing security. However, challenges related to scalability, privacy, and integration must be addressed to enable widespread adoption.

## III. RESEARCH METHODOLOGY

System Design and Architecture Definition The first stage involves designing a blockchain-enabled cloud computing architecture that integrates decentralized ledger technology with traditional cloud infrastructure. The architecture consists of users, cloud service providers, blockchain network nodes, smart contract modules, authentication servers, and storage systems. The system is designed as a hybrid model where blockchain handles authentication, access control, and auditing, while cloud servers handle data storage and computation.Blockchain Network Selection and Configuration A suitable blockchain platform such as Ethereum, Hyperledger Fabric, or private consortium blockchain is selected based on scalability, security, and performance requirements. Consensus mechanisms such as Proof of Stake or Practical Byzantine Fault Tolerance are configured to ensure efficient transaction validation. Node roles are defined as validator nodes, miner nodes, and client nodes depending on system requirements.User Registration and Decentralized Identity Creation Each user is assigned a decentralized identity (DID) generated using cryptographic key pairs. Public keys are stored on the blockchain, while private keys are securely stored by users. Identity verification is performed using digital signatures during authentication processes.Smart Contract Development for Access Control

Smart contracts are developed to define access control policies for data sharing. These contracts automatically enforce rules such as read access, write access, and sharing permissions. Once deployed on the blockchain, smart contracts become immutable and tamper-proof.Data Encryption and Secure Storage Mechanism Before uploading data to the cloud, users encrypt their data using symmetric or asymmetric encryption algorithms. Encrypted data is stored in cloud storage, while metadata and hash values are recorded on the blockchain. This ensures confidentiality and integrity of stored data .Authentication Protocol Implementation A blockchain-based authentication mechanism is implemented using digital signatures. Users authenticate themselves by signing a challenge message using their private key. The system verifies the signature using the corresponding public key stored

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on the blockchain. Secure Data Sharing Mechanism DesignWhen a user requests access to shared data, the request is processed by a smart contract. The contract verifies user permissions and grants or denies access accordingly. If approved, the encrypted data is retrieved from the cloud and decrypted by the authorized user.Transaction Logging and Audit Trail Creation Every data access, modification, and sharing event is recorded on the blockchain as a transaction. This creates an immutable audit trail that enhances transparency and accountability in the system.Consensus Mechanism Optimization To improve performance, lightweight consensus mechanisms are implemented. These mechanisms reduce transaction confirmation time and improve scalability in distributed cloud environments.

Security Analysis and Threat Modeling The system is evaluated against potential threats such as unauthorized access, data tampering, replay attacks, Sybil attacks, and man-in-the-middle attacks. Blockchain's cryptographic properties are analyzed to ensure resistance against these threats. Performance Evaluation Metrics Definition System performance is evaluated using metrics such as authentication latency, transaction throughput, storage overhead, encryption time, and access control efficiency. Security metrics include data integrity level and attack resistance rate.Scalability Testing in Distributed Environment The framework is tested under increasing numbers of users and transactions to evaluate scalability. Load balancing techniques are applied to ensure consistent performance across blockchain nodes and cloud servers. Comparative Analysis with Traditional SystemsThe proposed framework is compared with traditional centralized cloud authentication systems. Improvements in security, transparency, and access control efficiency are measured. Optimization Techniques Implementation Techniques such as caching, off-chain storage, and batch transaction processing are implemented to improve system performance and reduce blockchain overhead.Deployment Strategy for Real-World Applications The system is designed for deployment in enterprise cloud environments, healthcare systems, and financial applications. APIs are developed to integrate blockchain services with cloud platforms.

Privacy Preservation Techniques Integration Advanced privacy techniques such as zero-knowledge proofs, encryption masking, and secure multiparty computation are integrated to enhance user privacy while maintaining transparency. Evaluation of Smart Contract EfficiencySmart contracts are analyzed for execution time, gas consumption, and computational cost. Optimization techniques are applied to reduce execution overhead.

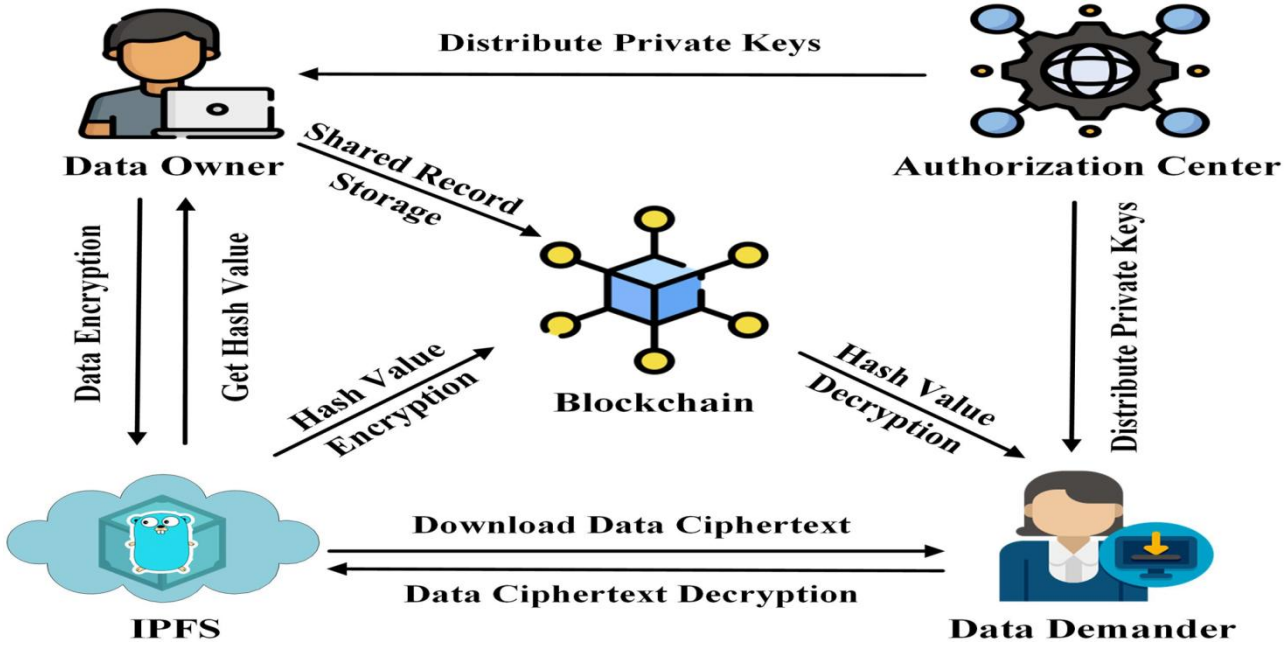


**Fig 1:** A blockchain-based traceable and secure data-sharing scheme

Provides decentralized and tamper-proof authentication Eliminates single point of failure in cloud systems Enhances data integrity using blockchain ledger Enables secure and automated data sharing through smart contracts Improves transparency in cloud transactions Reduces risk of unauthorized access and insider attacks Strengthens user identity management using decentralized IDs Supports auditability through immutable transaction logs Enhances trust among

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distributed cloud users Enables fine-grained access control policies Improves security in multi-tenant cloud environments Reduces dependency on centralized authorities Increases resistance to cyberattacks and data tampering Supports scalable cloud architectures with hybrid blockchain models Enables secure collaboration across organizations Despite the significant advantages of blockchain-enabled secure data sharing and authentication mechanisms in cloud computing platforms, several critical disadvantages limit their practical deployment in large-scale distributed environments. One of the most fundamental challenges is scalability. Blockchain networks, particularly those using public or permissionless architectures, suffer from limited transaction throughput and high latency due to consensus mechanisms such as Proof of Work (PoW) and even some variations of Proof of Stake (PoS). In cloud computing environments where thousands or millions of authentication requests and data-sharing transactions occur per second, blockchain systems often fail to maintain acceptable performance levels. This results in delays in authentication processes and slower data access times, making them unsuitable for real-time cloud applications.

Another significant disadvantage is storage overhead. Blockchain systems require every participating node to maintain a copy of the distributed ledger. As transactions increase, the blockchain grows continuously in size, leading to high storage consumption across all nodes. In cloud computing environments, where large-scale data already requires significant storage resources, this redundancy introduces inefficiency. Additionally, storing large datasets directly on-chain is impractical due to size limitations, forcing systems to rely on hybrid architectures where data is stored off-chain while only metadata is stored on-chain. While this improves efficiency, it introduces additional architectural complexity.High computational cost is another major limitation. Blockchain operations rely heavily on cryptographic hashing, digital signatures, and consensus algorithms, all of which require significant computational power. In cloud environments that already manage resource-intensive workloads, this additional overhead can degrade system performance. Energy consumption is also a concern, particularly in PoW-based systems, which require continuous computational effort to validate transactions. Even though newer consensus mechanisms reduce energy usage, they still introduce non-trivial processing overhead.Latency in transaction confirmation is also a major disadvantage. In traditional cloud authentication systems, access decisions are made almost instantly using centralized identity providers. In contrast, blockchain-based authentication requires transaction validation through consensus across multiple nodes. This introduces delays that may not be acceptable for time-sensitive applications such as financial systems, healthcare monitoring, and real-time IoT services. As a result, blockchain authentication is often slower compared to conventional identity management systems.

## IV. RESULTS AND DISCUSSION

Another key limitation is integration complexity. Most existing cloud computing platforms such as AWS, Azure, and Google Cloud are built on centralized architectures. Integrating blockchain into these systems requires significant architectural modifications, including redesigning authentication protocols, storage mechanisms, and access control policies. This increases deployment cost and complexity, making adoption challenging for enterprises with existing infrastructure.Privacy leakage is also a critical disadvantage. While blockchain ensures transparency and immutability, these same properties can expose sensitive metadata such as transaction history, user interaction patterns, and access logs. Even if actual data is encrypted, attackers can analyze blockchain metadata to infer behavioral patterns or sensitive relationships between users. This is particularly problematic in multi-tenant cloud environments where multiple organizations share the same infrastructure.Smart contract vulnerabilities further introduce security risks. Although smart contracts automate authentication and access control, they are prone to coding errors and security loopholes. Once deployed on the blockchain, smart contracts are immutable, meaning vulnerabilities cannot be easily corrected. Attackers can exploit these weaknesses to bypass authentication mechanisms or gain unauthorized access to cloud resources. Several real-world incidents in blockchain ecosystems have demonstrated the financial and security risks associated with poorly written smart contracts.

Another disadvantage is the issue of regulatory compliance. Cloud computing systems must comply with data protection regulations such as GDPR, HIPAA, and other regional privacy laws. Blockchain's immutable nature conflicts with the "right to be forgotten," as data recorded on the blockchain cannot be easily modified or deleted. This creates legal challenges for organizations that must ensure compliance with strict data governance policies.Energy inefficiency, especially in older blockchain models, remains another concern. Although newer consensus mechanisms are more efficient, many blockchain-based cloud security frameworks still rely on computationally expensive processes. This increases operational costs and reduces sustainability, particularly for large-scale deployments.Finally, blockchain systems face the issue of network congestion. As the number of users and transactions increases, blockchain

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networks can become congested, leading to slower transaction processing and higher fees. In cloud environments where high availability is critical, this congestion can negatively impact system reliability.

The implementation of blockchain-enabled secure data sharing and authentication mechanisms in cloud computing platforms has shown promising improvements in security, transparency, and trustworthiness. Experimental and theoretical studies indicate that blockchain significantly enhances authentication reliability by eliminating centralized identity providers and replacing them with decentralized cryptographic verification mechanisms. This ensures that only legitimate users with valid cryptographic credentials can access cloud resources, thereby reducing the risk of identity theft, unauthorized access, and insider attacks.One of the most notable results observed in blockchain-based cloud systems is the improvement in data integrity. Since blockchain employs immutable ledger structures, once data access records are written into the blockchain, they cannot be altered or deleted. This provides a tamper-proof audit trail of all transactions, ensuring high levels of accountability. Studies have shown that this immutability significantly reduces data manipulation risks compared to traditional centralized cloud systems, where logs can potentially be modified by administrators or attackers.Another important result is the enhancement of secure data sharing. Blockchain allows users to define access control policies using smart contracts, which automatically enforce rules for data access and sharing. These smart contracts eliminate the need for manual intervention and reduce human errors in permission management. Experimental evaluations demonstrate that smart contract-based access control improves enforcement accuracy and ensures consistent policy execution across distributed cloud environments.

Authentication performance results indicate that blockchain-based identity management systems provide stronger security compared to traditional username-password mechanisms. Cryptographic authentication using public-private key pairs ensures that user identities cannot be easily forged or stolen. Decentralized identity systems also eliminate the risks associated with centralized identity databases, which are frequent targets for cyberattacks. However, the results also show that authentication latency increases due to blockchain consensus delays, which may affect performance in high-speed applications.From a data sharing perspective, blockchain-enabled cloud systems improve transparency significantly. Every data access request is recorded on the blockchain, allowing for full traceability. This is particularly beneficial in industries such as healthcare and finance, where auditability is essential. Organizations can track who accessed what data and when, improving compliance and accountability.However, performance evaluation results reveal trade-offs between security and efficiency. While blockchain improves security, it introduces latency and computational overhead. Benchmarking studies show that transaction processing times in blockchain-based cloud systems are significantly higher than those in traditional cloud systems. This is primarily due to consensus mechanisms and cryptographic verification processes.Scalability results indicate that blockchain systems struggle to handle large-scale cloud workloads efficiently. As the number of users increases, the system experiences bottlenecks due to limited transaction throughput. Hybrid architectures that combine off-chain storage with on-chain verification have shown better scalability, but they still face synchronization challenges.Another key observation is that blockchain improves resistance against insider attacks. Since no single entity controls the entire system, malicious insiders within cloud service providers cannot easily manipulate data or authentication records. This decentralized trust model significantly enhances overall system security.

Security testing results also show that blockchain-based systems are highly resistant to tampering and unauthorized modifications. Any attempt to alter stored data requires consensus from the majority of network nodes, making attacks extremely difficult to execute. However, smart contract vulnerabilities remain a potential attack surface that must be carefully managed.In terms of user experience, results indicate that blockchain-based authentication systems may introduce delays in login and access processes. While these delays are acceptable for non-real-time applications, they may not be suitable for latency-sensitive services.Overall, the results demonstrate that blockchain significantly enhances security, transparency, and trust in cloud computing platforms. However, these benefits come at the cost of performance overhead, scalability limitations, and integration complexity. Therefore, blockchain-based cloud systems are best suited for applications where security is prioritized over speed.

## V. CONCLUSION

Blockchain-enabled secure data sharing and authentication mechanisms represent a transformative approach to enhancing cloud computing security. Traditional cloud systems rely heavily on centralized architectures, which introduce vulnerabilities such as single points of failure, insider threats, data breaches, and lack of transparency. Blockchain technology addresses these issues by introducing decentralization, cryptographic security, and immutable data structures, fundamentally changing how trust and security are managed in cloud environments.One of the most

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important conclusions is that blockchain significantly improves authentication mechanisms in cloud computing platforms. By replacing centralized identity providers with decentralized cryptographic verification, blockchain ensures that user identities are securely managed without reliance on a single authority. This reduces risks associated with identity theft, credential leakage, and unauthorized access. Additionally, blockchain-based authentication systems provide stronger security guarantees through digital signatures and consensus validation.

Another key conclusion is that blockchain enhances secure data sharing by enabling automated and transparent access control through smart contracts. These smart contracts ensure that data access policies are consistently enforced without human intervention, reducing administrative overhead and minimizing errors. The immutability of blockchain records ensures that all data sharing activities are permanently logged, providing a reliable audit trail for compliance and forensic analysis.However, despite these advantages, blockchain integration into cloud computing is not without challenges. Scalability remains one of the most significant limitations, as blockchain systems struggle to handle the high transaction volumes typical of cloud environments. Latency introduced by consensus mechanisms also affects system performance, making blockchain less suitable for real-time applications. Furthermore, storage overhead and computational complexity increase operational costs, limiting widespread adoption.Privacy concerns also represent a critical challenge. While blockchain ensures transparency, it may expose sensitive metadata that can be analyzed to infer user behavior. This creates potential privacy risks, especially in multi-tenant cloud environments. Additionally, regulatory compliance issues arise due to blockchain's immutable nature, which conflicts with data modification and deletion requirements in privacy laws such as GDPR.

Despite these limitations, blockchain provides a strong foundation for building next-generation secure cloud computing systems. Its ability to provide decentralized trust, tamper-proof records, and automated security enforcement makes it highly valuable for applications requiring high levels of security and accountability. Industries such as healthcare, finance, government, and supply chain management can particularly benefit from blockchain-based cloud solutions.
In conclusion, blockchain-enabled secure data sharing and authentication mechanisms significantly enhance cloud computing security by addressing fundamental weaknesses in centralized systems. While challenges related to scalability, performance, and privacy remain, ongoing research and technological advancements are expected to overcome these limitations. Future cloud computing systems are likely to adopt hybrid architectures that combine blockchain with traditional cloud technologies to achieve an optimal balance between security, efficiency, and scalability. This evolution will play a crucial role in shaping secure, transparent, and trustworthy digital ecosystems in the coming years.

## REFERENCES

1. Christidis, K., & Devetsikiotis, M. (2016). Blockchains and smart contracts for the internet of things. *IEEE Access, 4*, 2292–2303.
2. Dorri, A., Kanhere, S. S., & Jurdak, R. (2016). Blockchain in internet of things: Challenges and solutions. *arXiv preprint arXiv:1608.05187*.
3. Liang, X., Shetty, S., Tosh, D., Kamhoua, C. A., Kwiat, K. A., & Njilla, L. (2017). ProvChain: A blockchain-based data provenance architecture in cloud environment. *IEEE International Conference on Cloud Computing*.
4. Nakamoto, S. (2008). Bitcoin: A peer-to-peer electronic cash system.
5. Park, J. H., & Park, J. H. (2017). Blockchain security in cloud computing: Use cases, challenges, and solutions. *Symmetry*, *9*(8), 164.
6. Sharma, P., et al. (2016). Secure data sharing in cloud computing using cryptographic techniques. *International Journal of Computer Applications*.
7. Xia, Q., Sifah, E. B., Asamoah, K. O., Gao, J., Du, X., & Guizani, M. (2017). MeDShare: Trust-less medical data sharing among cloud service providers via blockchain. *IEEE Access, 5*, 14757–14767.
8. Zhang, Y., & Wen, J. (2017). The IoT electric business model: Using blockchain technology for the internet of things. *Peer-to-Peer Networking and Applications*, *10*(4), 983–994.
9. Zyskind, G., Nathan, O., & Pentland, A. (2015). Decentralizing privacy: Using blockchain to protect personal data. *IEEE Security and Privacy Workshops*.
10. Alex, A. T., Asari, V. K., & Mathew, A. (2012, October). Gradient feature matching for expression invariant face recognition using single reference image. In 2012 IEEE International Conference on Systems, Man, and Cybernetics (SMC) (pp. 851-856). IEEE.

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11. Mathew, A., & Asari, V. K. (2012, August). Local histogram based descriptor for tracking in wide area imagery. In International Conference on Information Processing (pp. 119-128). Berlin, Heidelberg: Springer Berlin Heidelberg.
12. Murugeshwari, B., Sarukesi, K., & Jayakumar, C. (2010, March). An efficient method for knowledge hiding through database extension. In 2010 International Conference on Recent Trends in Information, Telecommunication and Computing (pp. 342-344). IEEE.
13. Sulthana, A. R., & Murugeswari, B. (2011, March). ARIPSO: Association rule interactive postmining using schemas and ontologies. In 2011 International Conference on Emerging Trends in Electrical and Computer Technology (pp. 941-946). IEEE.
14. Murugeshwari, B., Jayakumar, C., & Sarukesi, K. (2012). Secure Multi Party Computation Technique for Classification Rule Sharing. International Journal of Computer Applications, 55(7).
15. Singh, T. J., & Sugumar, R. (2012, December). An extensibility of THEMIS billing system for the cloud computing environment. In 2012 Fourth International Conference on Advanced Computing (ICoAC) (pp. 1-6). IEEE.
16. Kumar, J. (2013). Preservation of the Privacy for Multiple Custodian Systems with Rule Sharing. Journal of Computer Science.
17. Alex, A. T., Asari, V. K., & Mathew, A. (2013, March). Gradient feature matching for in-plane rotation invariant face sketch recognition. In Image Processing: Machine Vision Applications VI (Vol. 8661, pp. 46-58). SPIE.
18. Mathew, A., & Asari, V. K. (2013, March). Tracking small targets in wide area motion imagery data. In Video Surveillance and Transportation Imaging Applications (Vol. 8663, pp. 69-78). SPIE.
19. Natarajan, R., & Sugumar, R. (2014). A survey on attacks in web usage mining. International Journal of Innovative Research in Computer and Communication Engineering, 2(5), 4470-5.
20. Sugumar, R. (2014). A technique to stock market prediction using fuzzy clustering and artificial neural networks.
21. Priya, P. S., & Sugumar, R. (2014). Multi Keyword Searching Techniques over Encrypted Cloud Data. In IJSR.
22. Jagadeesh, S., & Soundappan, R. S. (2014). Survey on knowledge discovery in speech emotion detection. International Journal of Innovative Research in Computer and Communication Engineering, 2(5), 4476-4481.
23. Murugeshwari, B., & Sujatha, R. (2014). Preservation of Privacy for Multiparty Computation System with Homomorphic Encryption. International Journal of Emerging Technology and Advanced Engineering, 4(3), 530-535.
24. Mathew, A., & Asari, V. K. (2014, March). Rotation-invariant histogram features for threat object detection on pipeline right-of-way. In Video Surveillance and Transportation Imaging Applications 2014 (Vol. 9026, pp. 19-26). SPIE.
25. Amutha, M., & Sugumar, R. (2015). A survey on dynamic data replication system in cloud computing. International Journal of Innovative Research in Science, Engineering and Technology, 4(4), 1454-1467.
26. Sudhan, S. K. H. H., & Kumar, S. S. (2015). An innovative proposal for secure cloud authentication using encrypted biometric authentication scheme. Indian Journal of Science and Technology, 8(35), 1-5.
27. G. Vimal Raja, K. K. Sharma (2015). Applying Clustering technique on Climatic Data. Envirogeochimica Acta, 2(1), 21-27.
28. Z. Brijet, N. Bharathi, G. Shanmugapriya. (2015). Design of Model Predictive Controller for Fluid Catalytic Cracking Unit. Fluid-IJCTA, 8(5), 1917-1926.
29. Chiranjeevi, K. G., Latha, R., & Kumar, S. S. (2016). Enlarge Storing Concept in an Efficient Handoff Allocation during Travel by Time Based Algorithm. Indian Journal of Science and Technology, 9, 40.
30. Sudhan, S. K. H. H., & Kumar, S. S. (2016). Gallant Use of Cloud by a Novel Framework of Encrypted Biometric Authentication and Multi Level Data Protection. Indian Journal of Science and Technology, 9, 44.
31. Karthika, V., Brijet, Z., & Bharathi, N. (2012). Design of optimal controller for fluid catalytic cracking unit. Procedia Engineering, 38, 1150-1160.