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(57) Abstract :
 The proposed invention introduces a Privacy-Preserving Auditing Mechanism for Cloud Computing Services, focusing on secure data integrity verification without compromising confidentiality. Utilizing advanced cryptographic techniques such as homomorphic encryption, bilinear pairing, and zero-knowledge proofs, the system enables third-party auditors to perform integrity checks without accessing sensitive information. The mechanism incorporates batch auditing and probabilistic sampling for scalability, ensuring efficiency even in large-scale cloud environments. Additionally, blockchain integration provides immutable and transparent audit logs, enhancing trust and accountability. The system is designed to resist security threats, including replay attacks and malicious collusion, while remaining adaptable to multi-cloud and hybrid architectures. Its applicability in healthcare, finance, and government sectors ensures compliance with regulatory standards. By combining security, efficiency, and privacy, this invention offers a robust solution for maintaining data integrity and trust in cloud computing services.

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