International Conference on Latest Trends in Science, Engineering, Management and Humanities (ICLTSEMH -2025)
19th January, 2025, Noida, India.

A Study of Scalable Cloud Architecture for Efficient Data Storage and Processing

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ABSTRACT

Scalable cloud architecture plays a crucial role in ensuring efficient data storage and processing in today's data-driven digital environment. It refers to a system design that can dynamically adjust computing resources—such as storage, processing power, and network capacity—based on workload demands. By leveraging cloud service models like Infrastructure as a Service (IaaS) and Platform as a Service (PaaS), organizations can store massive volumes of structured and unstructured data without investing in physical infrastructure. Distributed storage systems, data replication, and load balancing enhance reliability, fault tolerance, and availability of data. For efficient processing, scalable cloud architectures utilize parallel computing frameworks, containerization, and microservices, enabling faster data analytics and real-time processing. Technologies such as auto-scaling, virtualization, and serverless computing optimize resource utilization and reduce operational costs by allocating resources only when required. Additionally, cloud-based data processing supports advanced analytics, machine learning, and big data applications by providing high-performance computing environments. Security and data integrity are maintained through encryption, access control, and compliance mechanisms.