CLOUD COMPUTING: A COMPREHENSIVE REVIEW OF ARCHITECTURES, SERVICES AND EMERGING TRENDS IN SCALABLE COMPUTING

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ABSTRACT

Cloud computing has transformed the digital sphere by providing scalable, cheap resources and access to Internet computing. The paper offers an all-encompassing review of cloud computing, look into its architectures, models of services and ways of deploying, and recent developments. This further goes into virtualization, containerization and orchestration technologies such as Docker or Kubernetes. The review discusses service models like Infrastructure as a Service, Platform as a Service and Software as a Service and deployment models such as public, private, hybrid and multi-cloud. Important cloud-native principles, enhancing portability and operational efficiencies are also discussed. Challenges related to data privacy, compliance, interoperability and resource management are presented. Mitigation techniques encompass zero-trust security with automated tools. Also, future trends such as AI integration, green computing, and the convergence with 5G and IoT are explored in detail, giving insights for practitioners and researchers alike.

Keywords*: Cloud Computing, Cloud Deployment Models, Hybrid Cloud, Google Cloud Platform (GCP), Big Data Analytics, Artificial Intelligence, Cloud Security, Cloud Management*

1. INTRODUCTION

Cloud computing has fostered new ways that organizations and individuals get access to computational resources, enabling on-demand delivery of services over the Internet such as storage, applications, and infrastructure. It thus provides scalable and flexible alternatives without the traditional hardware investment and supports the ongoing digital transformation across sectors [1,2]. Service models like Infrastructure as a Service, Platform as a Service, and Software as a Service provide different levels of user control and customization. Deployment models comprising public cloud, private cloud, hybrid cloud, and community cloud are available to provide organizations strategic flexibility [3]. The recent developments in multi-cloud architecture, virtualization, and software-defined environment have further improved performance and agility. However, there are still challenges with security issues, compliance, and interoperability that need to be tackled [4, 5]. The present review gives a detailed discussion about the scalable cloud system architecture, service models, and future trends.