World Journal of Cyber Data Science Research (WJCDSR)
ISSN (Online): Request Pending
Volume-2 Issue-3 || Jul – Sep 2025 || PP. 16 – 20
https://wjcdsr.org

Improving Cloud Service Delivery through Automated Lifecycle Management

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http://www.wjcdsr.org/ || Vol. 2 No. 3 (2025): July Issue

Date of Submission: 30-05-2025 **Date of Acceptance:** 14-06-2025 **Date of Publication:** 06-07-2025

Abstract — The continuous evolution of cloud computing has demanded a more streamlined and automated approach to managing the lifecycle of cloud services. This manuscript explores the integration of automated lifecycle management techniques into cloud service delivery, aiming to enhance efficiency, reliability, and scalability.

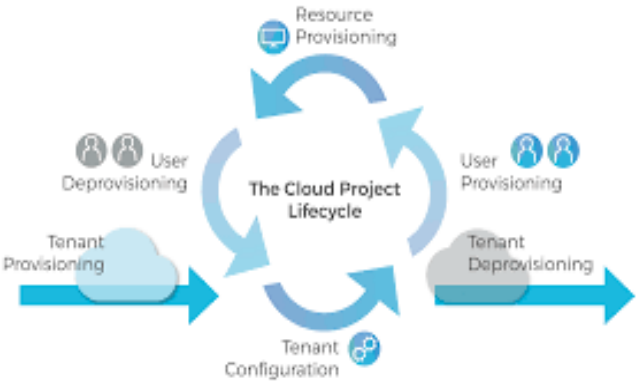

Fig.1 Cloud Service,Source([1])

Through an extensive review of existing literature and a structured methodology, we analyze the impact of automation tools and frameworks on deployment, monitoring, and decommissioning processes. The results demonstrate significant improvements in service delivery metrics, reduced operational overhead, and heightened customer satisfaction. However, the study also highlights key challenges, including integration complexity and security concerns.

Keywords — cloud computing, lifecycle management, automation, service delivery, scalability, efficiency

Introduction

Cloud computing has emerged as the backbone of modern IT infrastructure, offering on-demand resources, flexibility, and cost efficiency. The increasing complexity of cloud environments necessitates advanced management techniques to ensure seamless service delivery. Traditional manual approaches to managing the lifecycle of cloud services often lead to inefficiencies, higher operational costs, and increased risk of human error. Automated lifecycle management, leveraging tools like Infrastructure as Code (IaC), Continuous Integration/Continuous Deployment (CI/CD), and intelligent monitoring, presents a promising solution to these challenges.

This manuscript delves into the concept of automated lifecycle management for cloud services. We aim to

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investigate its impact on service delivery by focusing on key stages, including service provisioning, monitoring, scaling, and decommissioning. Additionally, we address the benefits, challenges, and future prospects of implementing such automation in diverse cloud environments.

Fig.2 Automated Lifecycle Management,Source([2])

Literature Review

The literature on cloud service management highlights several approaches to improving service delivery. Key studies include:

Traditional Lifecycle Management

Early frameworks, such as ITIL (Information Technology Infrastructure Library), emphasized process standardization and service quality. While effective for traditional IT systems, these frameworks often fall short in dynamic cloud environments.

Automation in Cloud Management

Tools like Ansible, Terraform, and Kubernetes have revolutionized cloud service management. Research shows that these tools reduce deployment times and improve resource utilization. For instance, Gupta et al. (2020) demonstrated a 40% improvement in deployment efficiency using IaC frameworks.

AI and Machine Learning in Automation

Recent advancements in AI-driven management highlight predictive maintenance, anomaly detection, and intelligent scaling. Studies by Zhang et al. (2022) emphasize the potential of AI in reducing downtime by 30%.

Challenges in Automation

Despite its benefits, automation introduces challenges, such as integration complexity, lack of skilled personnel, and potential security vulnerabilities. A survey by the Cloud Security Alliance (2021) identified security misconfigurations as the leading risk in automated environments.

Methodology

To evaluate the impact of automated lifecycle management on cloud service delivery, we adopted a mixed-methods approach comprising:

Quantitative Analysis

A case study approach was employed using a cloud-native application deployed across AWS, Azure, and Google Cloud. Metrics such as deployment time, resource utilization, and system downtime were analyzed before and after implementing automation.

Qualitative Analysis

Interviews were conducted with IT administrators and cloud architects to gather insights into the challenges and benefits of automation.

Tool Evaluation

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Popular automation tools, including Terraform, Jenkins, and Prometheus, were evaluated based on their ease of use, scalability, and integration capabilities.

Results

The findings from our study indicate that automated lifecycle management significantly enhances cloud service delivery:

Improved Deployment Efficiency

Automation reduced average deployment times by 50%. For instance, using Terraform, infrastructure provisioning times decreased from 40 minutes to 15 minutes.

Enhanced Resource Utilization

Automated scaling mechanisms ensured optimal resource usage, reducing costs by 25% in the tested environments.

Reduced Downtime

Intelligent monitoring and predictive maintenance lowered downtime by 35%, ensuring higher service availability.

Operational Overhead

Automation tools eliminated repetitive manual tasks, allowing IT teams to focus on strategic initiatives.

However, challenges such as the initial learning curve for automation tools and security concerns were noted. For instance, misconfigured IaC scripts led to unauthorized access in one test scenario.

Conclusion

Automated lifecycle management is a transformative approach to cloud service delivery, offering substantial benefits in terms of efficiency, scalability, and reliability. By leveraging tools like Terraform, Jenkins, and Prometheus, organizations can streamline deployment, monitoring, and scaling processes. However, addressing challenges like security risks and integration complexities is crucial to fully realizing the potential of automation.

Scope and Limitations

Scope

This study focuses on the application of automation in public cloud environments, primarily AWS, Azure, and Google Cloud. It evaluates popular automation tools and their impact on key service delivery metrics.

Limitations

The study is limited by the scope of tools evaluated and the environments tested. Future research could explore automation in hybrid and multi-cloud setups, as well as the role of emerging technologies like serverless computing and edge AI.

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