International Journal of Computer Science and Engineering (IJCSE)
ISSN (P): 2278–9960; ISSN (E): 2278–9979
Vol. 13, Issue 2, Jul–Dec 2024; 1109–1144

International Academy of Science, Engineering and Technology
Connecting Researchers; Nurturing Innovations

DESIGNING HIGH-AVAILABILITY DEVOPS PIPELINES FOR CLOUD ENVIRONMENTS

Arun Mulka[1] & Sheetal Singh[2]

[1]Kakatiya University, Warangal, Telangana, India

[2]Sociology in School of Law, INMANTEC (Integrated Academy of Management and Technology), Ghaziabad (U.P.)

ABSTRACT

High availability is critical in cloud-native environments to make operations seamless and services uninterrupted. DevOps pipelines—the backbone of every CI/CD process—have to be resilient, scalable, and fault-tolerant to meet the demands of modern businesses. This paper will look at the design and implementation of high-availability DevOps pipelines tailor-made for cloud platforms. The major components making pipeline resilience real—automatic failover mechanisms, multi-region deployments, and load-balancing strategies—are all discussed in detail. By using cloud services such as IaC, container orchestration, and microservices architectures, this approach reduces downtime and enhances system reliability. The design principles focus on redundancy, automated recovery, and proactive monitoring using observability tools like Prometheus and ELK Stack. Additionally, tight integration with version control systems, automated testing frameworks, and blue-green deployment strategies ensure a smooth and resilient CI/CD process. The paper further highlights the use of self-healing mechanisms in combination with immutable infrastructure to lessen potential disruptions during software delivery. These best practices can be adopted by organizations to bring a significant increase in pipeline availability and a decrease in Mean Time to Recovery (MTTR). The proposed solution also includes cost-effective strategies for balancing performance with cloud resource optimization. This study will provide a comprehensive guide for DevOps teams looking to build and manage high-availability pipelines in cloud environments, supporting continuous innovation while maintaining service reliability. Future developments of machine learning-driven DevOps and chaos engineering are also considered as emerging trends to improve availability further.

KEYWORDS: *High Availability, DevOps Pipelines, Cloud Environments, Continuous Integration, Continuous Deployment, Fault Tolerance, Scalability, Automated Recovery, Infrastructure as Code, Observability, Redundancy, Resilience, Self-Healing Systems, Immutable Infrastructure, Cloud-Native Architecture*

Article History

Received: *04 Dec 2024* **|** ***Revised:*** *12 Dec 2024* **|** ***Accepted:*** *14 Dec 2024*
