A Comprehensive Comparative Analysis of DevOps Practices for Modern IT Infrastructure Management

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Abstract

This article presents a comparative study of essential DevOps practices for managing modern IT infrastructure. It focuses on three key practices: Continuous Integration/Continuous Deployment (CI/CD), Infrastructure as Code (IaC), and Automated Monitoring. Each practice is evaluated for its role in enhancing delivery speed, system stability, and team collaboration. The study concludes with best practices, challenges, and future research directions.

1 Introduction

The increasing complexity of IT infrastructure has driven organizations to adopt DevOps, which integrates software development and IT operations. This comparative study explores how key DevOps practices impact software delivery, operational efficiency, and scalability.

2 Research Methodology

A comprehensive review of scientific papers, industry whitepapers, and official DevOps guides was conducted. The practices were analyzed based on implementation complexity, operational efficiency, and business impact.

3 Comparative Analysis of Key DevOps Practices

3.1 Continuous Integration/Continuous Deployment (CI/CD)

CI/CD automates software delivery by continuously integrating code changes and deploying applications.

3.1.1 Advantages

- Accelerated time to market
- Reduction in human errors
- Enhanced software quality

3.1.2 Challenges

- Complex initial setup
- Requires cultural adaptation

Table 1: CI/CD Tools Comparison

Tool	**Strengths**	**Use Case**
Jenkins	Open-source, extensible	CI/CD automation
GitLab CI/CD	Integrated DevOps suite	End-to-end delivery
Azure DevOps	Cloud integration	Enterprise projects

3.2 Infrastructure as Code (IaC)

IaC automates IT infrastructure management using scripts, ensuring consistent and scalable environments.

3.2.1 Advantages

- Environment standardization
- Expedited deployment times
- Simplified disaster recovery

3.2.2 Challenges

- Code complexity
- Risk of configuration drift

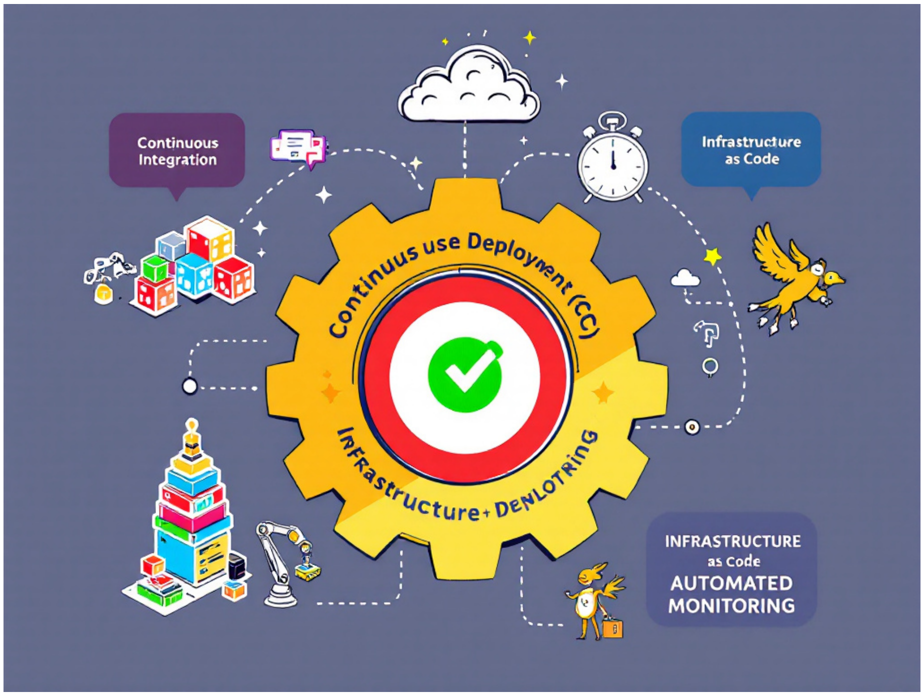
Continuous Integration
Infrastructure as Code
Continuus use Deployment (CC)
Infrastructure+ DENLOTRING
INFRASTRUCTURE as Code AUTOMATED MONITORING

Figure 1: IaC Workflow

3.3 Automated Monitoring and Incident Management

Automated monitoring tracks system performance, detects anomalies, and reduces downtime through proactive alerts.

3.3.1 Advantages

- Enhanced reliability
- Improved incident response
- Reduced operational costs

3.3.2 Challenges

- Alert fatigue from false positives
- High setup and maintenance costs

Table 2: Automated Monitoring Tools Comparison

Tool	**Strengths**	**Use Case**
Nagios	Open-source, flexible	Network monitoring
Prometheus	Powerful query language	Metrics and alerts
Datadog	Cloud-based, user-friendly	Full-stack monitoring

Table 3: DevOps Practices Comparison

Practice	**Delivery Speed**	**System Reliability**	**Scalability**
CI/CD	High	Moderate	High
Infrastructure as Code (IaC)	Moderate	High	High
Automated Monitoring	Low	High	Moderate

4 Comparative Findings

5 Conclusion

The integration of CI/CD, IaC, and Automated Monitoring results in a more efficient IT infrastructure. CI/CD accelerates deployment, IaC ensures consistency, and monitoring guarantees reliability. Future research should explore AI-powered monitoring for predictive maintenance.

6 References

References

References

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