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A Review on CI/CD Pipeline with Technologies, Tools and Challenges

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Abstract: *Software development approaches that priorities continuous integration, delivery, and deployment enable companies to consistently provide new features and products. CI/CD has become one of the most important DevOps methods that automates the software development, testing, and delivery processes. This paper provides a detailed description of the CI/CD architecture, pipeline design, tools, optimization techniques, and adoption considerations. It describes the evolution of Continuous Integration into Continuous Delivery and Continuous Deployment, and how these methods are applied to improve code quality, accelerate delivery, and foster collaboration between development teams. This review provides a high-level overview of the CI/CD pipeline and the steps involved, including code commit, build, test, deploy, and monitor, along with popular platforms such as Jenkins, GitLab CI, Azure DevOps, CircleCI, Docker, and AWS services. Besides, the key optimization techniques, parallel execution, dependency caching and incremental builds, are described to enhance pipeline performance. The paper concludes that the barriers to CI/CD adoption can be technical, organisational, and cultural, especially in legacy and regulated industries, and it defines how to achieve effective and sustainable automation in software engineering today.*

Keywords: Continuous Integration (CI) and Delivery (CD), Continuous Deployment, CI/CD Pipeline, Test Automation, Monitoring and Logging, DevSecOps