AI, CI/CD, DevOps

27.06.2025

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AGENDA

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CI/CD

Continuous Integration / Continuous Deployment

CI/CD is a DevOps practice that ensures code changes are automatically built, tested, and deployed to production environments.

It helps maintain software quality and accelerates release cycles by detecting issues early in the development process.

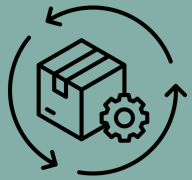
CODE > BUILD > TEST > DEPLOY

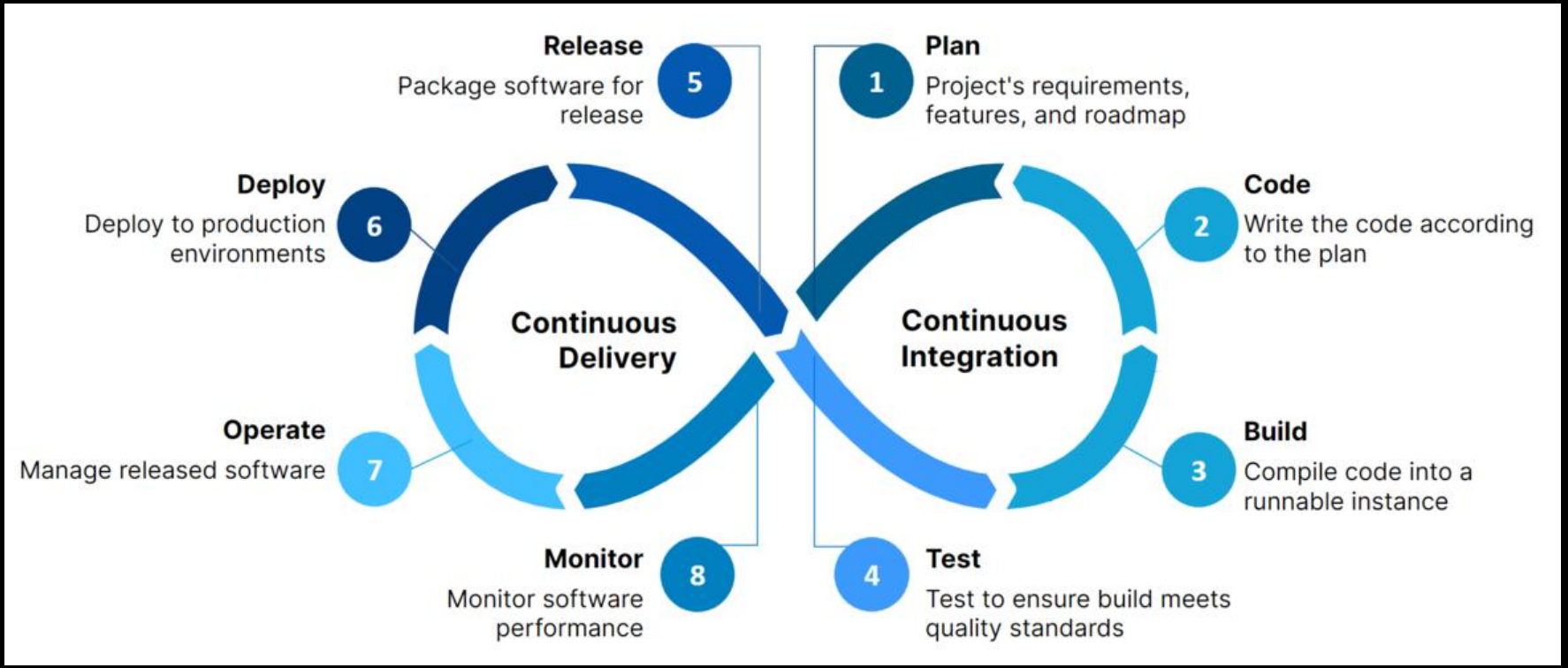
CI

Regular integration of code changes into a shared repository, verified by automated builds and tests.

CD

Automated delivery of applications to production after passing tests.





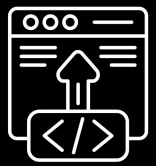
Plan → Code → Build → Test → Release → Deploy → Operate → Monitor

Benefits

Faster delivery, better code quality, and reduced manual effort.

Faster Time-to-Market

Quickly release new features and updates.



Improved Code Quality

Early bug detection and fixes.

Increased Productivity

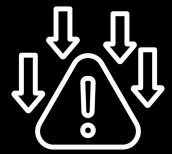
Developers focus on innovation, not repetitive tasks.

Better Collaboration

Streamlined teamwork and faster issue resolution.

Reduced Risk

Minimize human error and ensure consistent releases.



Demo: CI/CD Pipeline with GitHub Actions

GitHub Actions is a continuous integration and continuous delivery (CI/CD) platform built into GitHub.

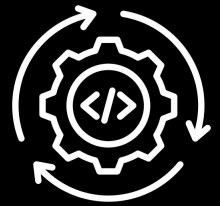
- **Workflows:** These are automated processes that you define in your GitHub repository. They consist of a series of jobs that run in a specific order.
- **Jobs:** A job represents a set of steps that run on a virtual machine or in a container. Jobs can run sequentially or in parallel.
- **Steps:** Each step in a job is a single command or task that is executed. Steps can be built-in actions or custom actions that you create.
- **Actions:** These are reusable units of code that perform a specific task, such as checking out code, running tests, or deploying to a server. You can find a wide variety of actions in the GitHub Marketplace, or you can create your own.
- **Events:** Workflows are triggered by events that occur in your repository, such as pushes to branches, pull requests, or issues being created.

Why Integrate AI into CI/CD?

- **Reduce Manual Effort:** reduces significant manual intervention for tasks like code review, test case prioritization, and failure analysis.
- **Proactive Problem Detection:**AI predicts potential build or deployment failures before they occur, minimizing downtime.
- **Enhanced Decision-Making:**AI analyzes historical data to recommend optimal deployment strategies or test suites.
- **Improved Security:**AI-powered tools like Snyk and Dependabot detect vulnerabilities in dependencies and codebases in real-time.
- **Faster Time-to-Market:**AI accelerates the development cycle by optimizing pipeline efficiency and reducing errors.

Code Quality Analysis	AI-driven tools (DeepCode) detect vulnerabilities early. AI suggests fixes for complex issues, streamlining the review process.
Vulnerability Scanning	Continuous monitoring of dependencies and infrastructure using tools like Snyk.
Test Automation	AI identifies redundant or low-value test cases, saving execution time. Intelligent test case generation for edge cases often missed by developers.
Predictive Analytics	AI analyzes previous build data to predict deployment risks.
Enhanced Security	AI can identify and mitigate security threats in real-time ensuring the integrity and security of the CI/CD pipeline.
AI Suggestions	AI can help assist in the coding stage, may it be development or writing pipelines

Aspects of CI/CD Enhanced by AI



Aspect of CI/CD	Description	Paid Tools	Free/Open Source Tools
Code Quality Analysis	Analyzes code to detect bugs, vulnerabilities, and performance issues.	SonarQube, Code Climate	SpotBugs, Pylint
Test Automation	Automates test creation, execution, and maintenance using AI.	Mabl, Testim	Selenium, Appium
Enhanced Security	Identifies and mitigates security threats in real-time.	Checkmarx, Synopsys	OWASP ZAP, Brakeman
AI Suggestions	Provides intelligent code suggestions and assists developers in writing code.	GitHub Copilot, Amazon CodeWhisperer	TabNine, Kite
Predictive Analytics	Predicts future application performance issues and potential problems.	Dynatrace, New Relic	Prometheus, Grafana
Vulnerability Scanning	Identifies and prioritizes vulnerabilities in applications and systems.	Rapid7, Tenable	OpenVAS, Nessus

Demo: with Snyk

Snyk is a developer security platform that helps organizations find and fix vulnerabilities in their code, open-source dependencies, containers, and infrastructure as code.

- Scans code, open-source dependencies, container images, and infrastructure as code for known vulnerabilities.
- Identifies vulnerabilities in various programming languages, including JavaScript, Python, Java, and more.
- Provides detailed information about each vulnerability, including severity, CVSS score, and remediation steps.

Thank you

Content

- https://docs.github.com/
- Google Gemini
- https://snyk.io/
- Chat gpt

Images

- https://www.flaticon.com
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- https://www.freepik.com/icons

Misc

- https://medium.com/@sehban.alam/integrating-artificial-intelligence-ai-in-ci-cd-pipeline-1a7b4b4683a3
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