
🧱 What is Jenkins?

Jenkins is an **open-source automation server** used to automate parts of the **software development lifecycle (SDLC)**, such as:

- Building
- Testing
- Delivering
- Deploying software

It enables **Continuous Integration (CI)** and **Continuous Delivery (CD)** — often called **CI/CD**.

> Jenkins allows developers to automatically build, test, and deploy their code every time changes are made, reducing manual work and speeding up development cycles.

🚀 Key Features

Feature	Description
🔄 Continuous Integration	Automatically builds and tests code when pushed to version control (e.g., Git)
📦 Plugin-based	Over 1,800 plugins support tools like Git, Maven, Docker, Kubernetes, etc.
🌐 Web Interface	Easy-to-use dashboard to manage jobs, pipelines, and configurations
🛠️ Extensible	You can write custom plugins or scripts
⚙️ Pipeline as Code	Supports **Jenkinsfile** to define build pipelines using code (declarative or scripted)
⏱️ Scheduling	Cron-like scheduling for tasks
📊 Reporting	Generates test reports, code coverage, and build status

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🧪 CI/CD with Jenkins

1. Continuous Integration (CI)

- Developers push code to a shared repository (e.g., GitHub, GitLab).
- Jenkins detects changes and:
    - Pulls the new code
    - Compiles/builds it
    - Runs automated tests (unit/integration)
    - Notifies developers of success/failure

2. Continuous Delivery (CD)

- After successful testing, Jenkins can:
    - Package the application (e.g., into a Docker image)
    - Deploy it to staging or production environments
    - Integrate with cloud platforms or Kubernetes

🛠️ How Jenkins Works

1. Master-Agent Architecture

- **Master**: Coordinates jobs, schedules builds, sends tasks to agents.
- **Agents (Slaves)**: Run the jobs (builds/tests) on remote or local machines.

2. Jobs

A *job* is a task, such as building a project, running tests, or deploying an app. Types of jobs:

- Freestyle project
- Pipeline
- Multibranch Pipeline
- External job

3. Pipeline (Jenkinsfile)

Written in Groovy-like syntax:

```
pipeline {
  agent any
  stages {
    stage('Build') {
      steps {
        echo 'Building...'
      }
    }
    stage('Test') {
      steps {
        echo 'Testing...'
      }
    }
    stage('Deploy') {
      steps {
        echo 'Deploying...'
      }
    }
  }
}
```

This file is usually committed to the root of your project repository.

📦 Common Jenkins Integrations

Tool	Use Case

Git/GitHub	Source code versioning
Maven/Gradle	Java project builds
Docker	Containerization
Kubernetes	Container orchestration
Slack/Email	Notifications
SonarQube	Code quality analysis
Selenium	UI test automation
Ansible	Configuration management & deployment

📍 Where Jenkins Fits in DevOps

Jenkins is at the **core of DevOps pipelines**:

[Code] → [Build] → [Test] → [Package] → [Release] → [Deploy] → [Operate] → [Monitor]
↑---------- Jenkins automates this ----------↑

✅ Pros of Jenkins

- Mature and widely adopted
- Huge plugin ecosystem
- Strong community support
- Flexibility across languages and environments
- Scalable with distributed builds

⚠️ Challenges with Jenkins

- Complex setup for large projects
- Plugin dependency issues
- UI can feel outdated
- Requires manual management unless configured with tools like Docker/Kubernetes

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🐳 Jenkins in Modern DevOps

In modern setups, Jenkins is often:

- Run inside **Docker** containers
- Managed via **Infrastructure as Code**
- Integrated with **Kubernetes** and **cloud-native tools**
- Paired with tools like **GitHub Actions** or **GitLab CI** when needed

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