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Experiment no. 4: To understand Continuous Integration, Install and Configure Jenkins with Maven/Ant/Gradle to setup a build job

1. Introduction to Continuous Integration (CI)

Continuous Integration (CI) is a software development practice where developers frequently integrate code into a shared repository. Each integration is automatically tested to detect errors early. The key goals of CI are:

- Detect and fix bugs early.
- Improve software quality.
- Speed up the development process.
- Ensure code consistency and automation.

CI relies on automated build tools and testing frameworks to verify code changes before merging them into the main codebase.

2. Role of Jenkins in CI

Jenkins is an open-source automation server widely used for implementing CI/CD pipelines. It automates the process of building, testing, and deploying applications. Jenkins can be integrated with various build tools such as Maven, Ant, and Gradle to streamline software development.

- Free and open-source.
- Supports multiple plugins for extensibility.
- Allows automated builds and tests.
- Provides an easy-to-use web-based interface.
- Can integrate with various DevOps tools like Git, Docker, Kubernetes, etc.

3. Installing Jenkins

a. Prerequisites

Before installing Jenkins, ensure that the following software is installed:

- Java (JDK 8 or later)
- Apache Maven/Ant/Gradle (for build automation)
- Git (for version control)

b. Installation Steps

1. **Download Jenkins**:
   - Download the latest stable Jenkins version from Jenkins official website.
   - Install Jenkins using the appropriate installer (Windows, Linux, macOS).
2. **Start Jenkins**:
   - On Windows: Run java -jar jenkins.war from the command line.
   - On Linux/macOS: Use system services or run Jenkins as a Docker container.
3. **Access Jenkins**:
   - Open a web browser and navigate to http://localhost:8080/.
   - Unlock Jenkins using the initial administrator password found in the installation logs.
4. **Install Plugins**:
   - During the initial setup, install recommended plugins.
   - Additional plugins like "Maven Integration", "Gradle Plugin", or "Ant Plugin" can be installed from **Manage Jenkins > Manage Plugins**.

4. Configuring Jenkins with Maven/Ant/Gradle

Jenkins can be configured to use any of the popular build tools:

a. Configuring Maven in Jenkins

1. **Install Maven Plugin**:
   - Navigate to Manage Jenkins > Manage Plugins.
   - Search for **Maven Integration Plugin** and install it.
2. **Set Up Maven in Jenkins**:
   - Go to Manage Jenkins > Global Tool Configuration.
   - Add a new Maven installation by specifying the path or letting Jenkins install it automatically.
3. **Create a Maven Build Job**:
   - Click on New Item > Freestyle Project.
   - In **Build Environment**, select **Invoke top-level Maven targets**.
   - Provide the build goals (e.g., clean install).
   - Save and trigger the build.

b. Configuring Ant in Jenkins

1. **Install Ant Plugin**:
   - Go to Manage Plugins and install the **Ant Plugin**.
2. **Set Up Ant**:
   - Go to Manage Jenkins > Global Tool Configuration.
   - Add Ant by specifying its installation path.
3. **Create an Ant Build Job**:
   - Create a new **Freestyle Project**.
   - In **Build Steps**, choose **Invoke Ant**.
   - Provide the target (e.g., compile or build.xml location).
   - Save and build the job.

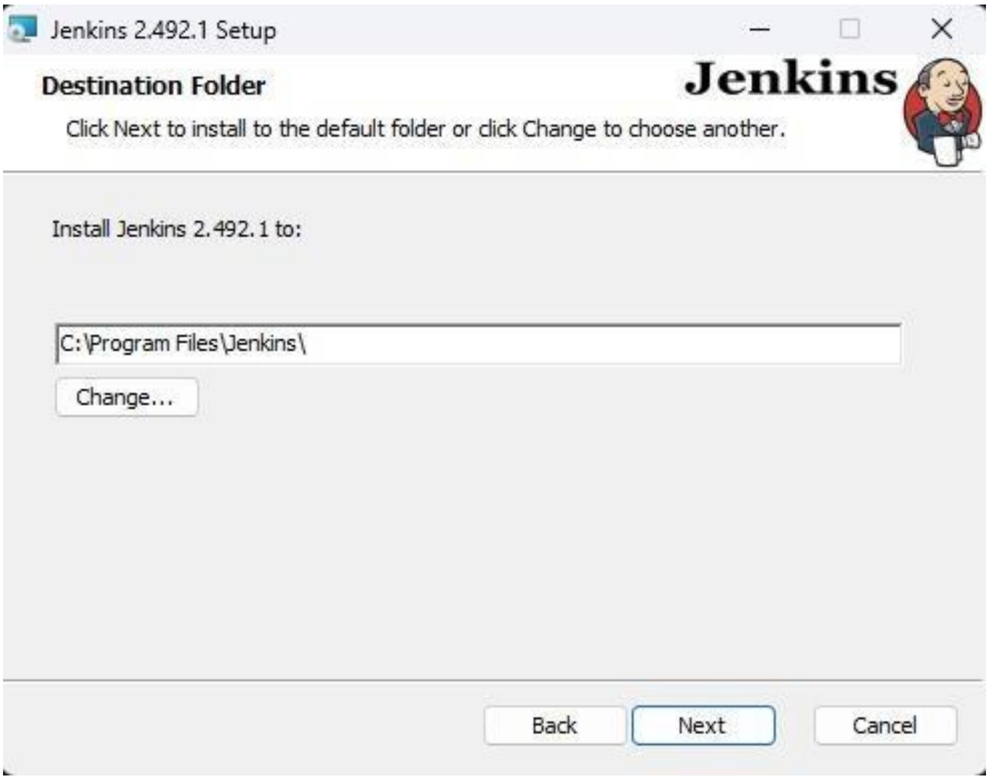
c. Configuring Gradle in Jenkins

1. **Install Gradle Plugin**:
   - Go to Manage Plugins and install the **Gradle Plugin**.
2. **Set Up Gradle**:
   - Navigate to Manage Jenkins > Global Tool Configuration.
   - Add Gradle by specifying its installation path.
3. **Create a Gradle Build Job**:
   - Create a new **Freestyle Project**.
   - In **Build Steps**, select **Invoke Gradle Script**.
   - Specify tasks (e.g., clean build).
   - Save and run the build.

5. Running and Monitoring the Build Job

After setting up a build job:

- Click **Build Now** to trigger the job.
- Monitor progress in the **Build Console Output**.
- Review logs and test results.
- Set up notifications (email, Slack, etc.) for build failures.



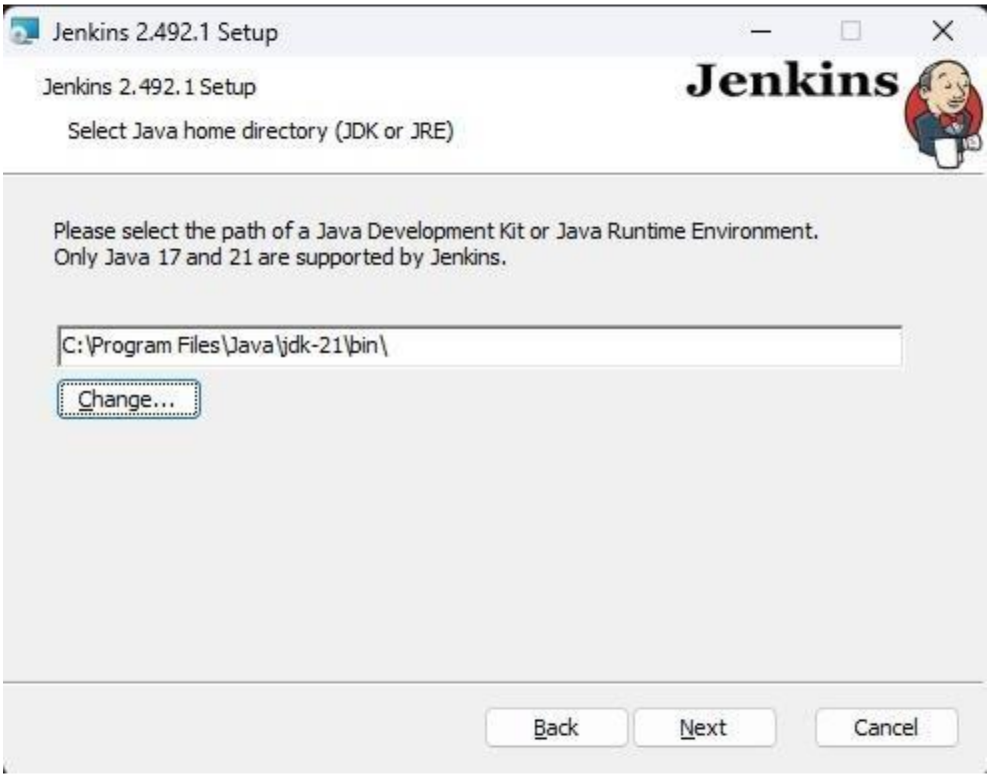
Jenkins 2.492.1 Setup

Destination Folder

Click Next to install to the default folder or click Change to choose another.

Install Jenkins 2.492.1 to:

C:\Program Files\Jenkins\



Jenkins 2.492.1 Setup

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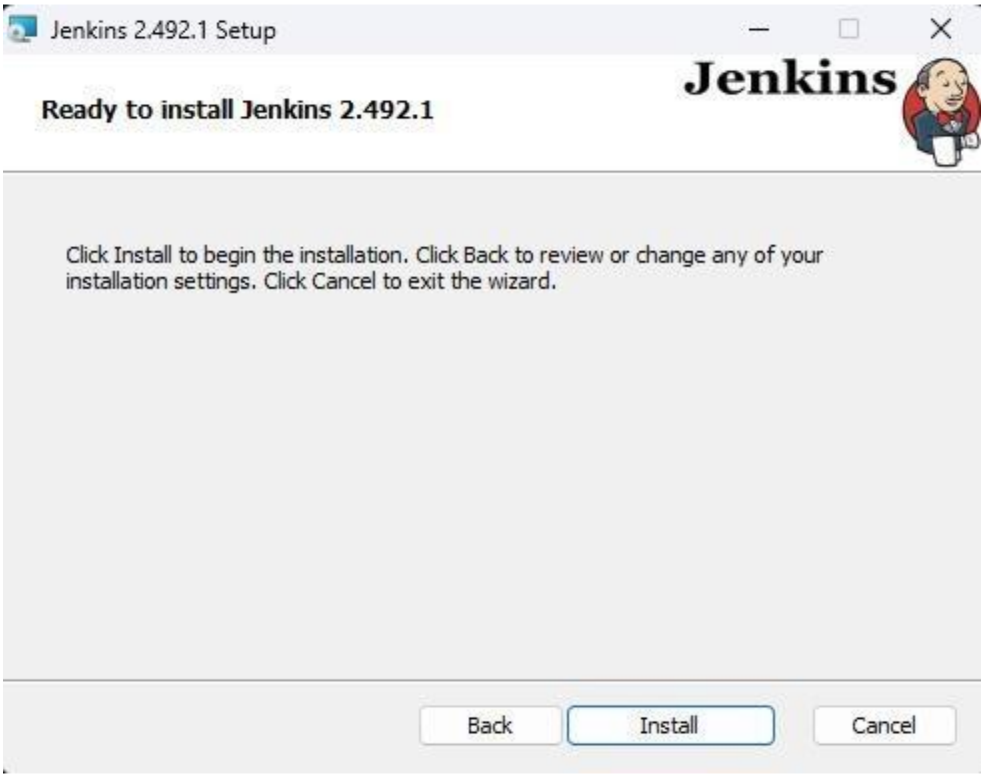
Select Java home directory (JDK or JRE)

Please select the path of a Java Development Kit or Java Runtime Environment.
Only Java 17 and 21 are supported by Jenkins.

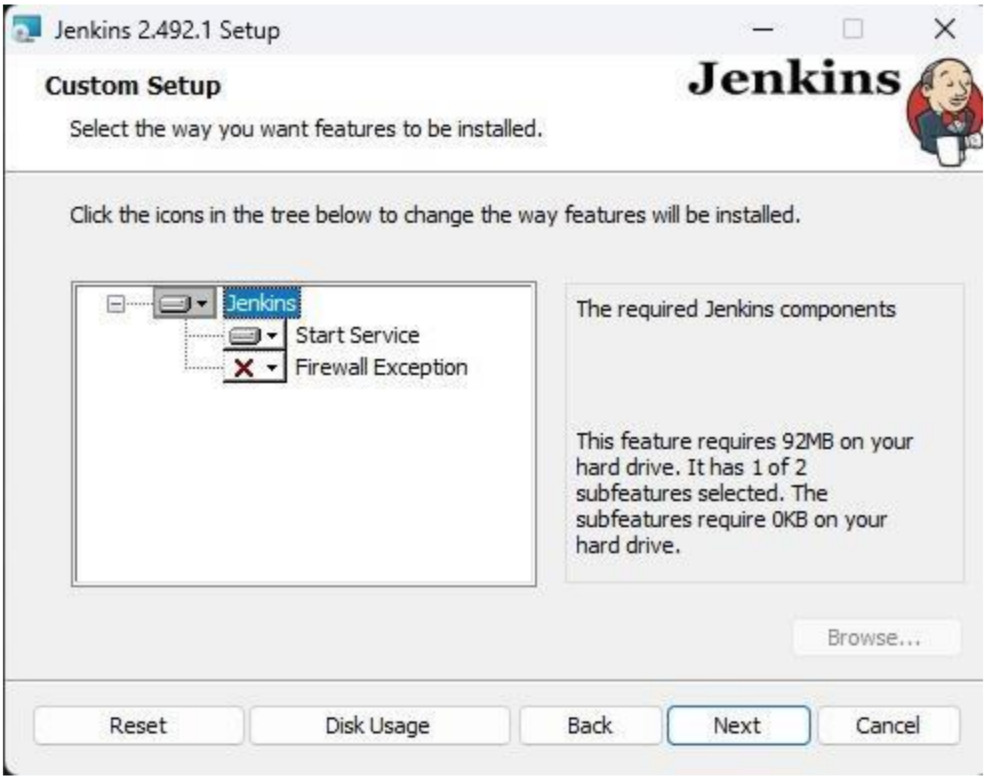
C:\Program Files\Java\jdk-21\bin\



Jenkins 2.492.1 Setup

Ready to install Jenkins 2.492.1

Click Install to begin the installation. Click Back to review or change any of your installation settings. Click Cancel to exit the wizard.



Jenkins 2.492.1 Setup

Custom Setup

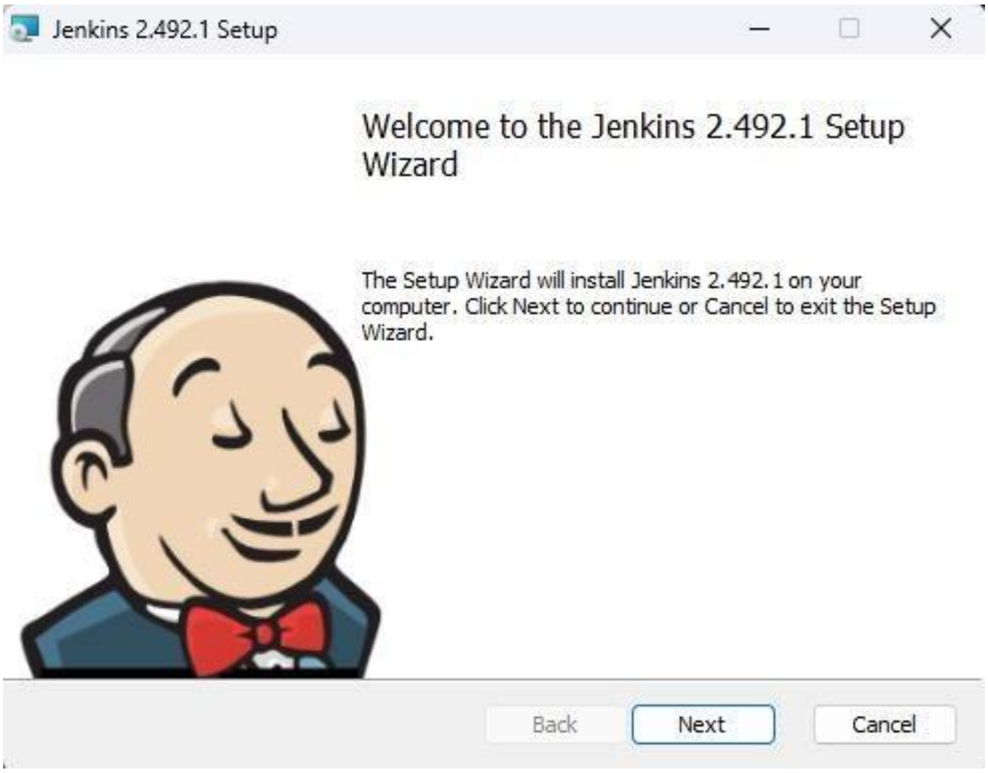
Select the way you want features to be installed.

Click the icons in the tree below to change the way features will be installed.

- Jenkins
  - Start Service
  - Firewall Exception

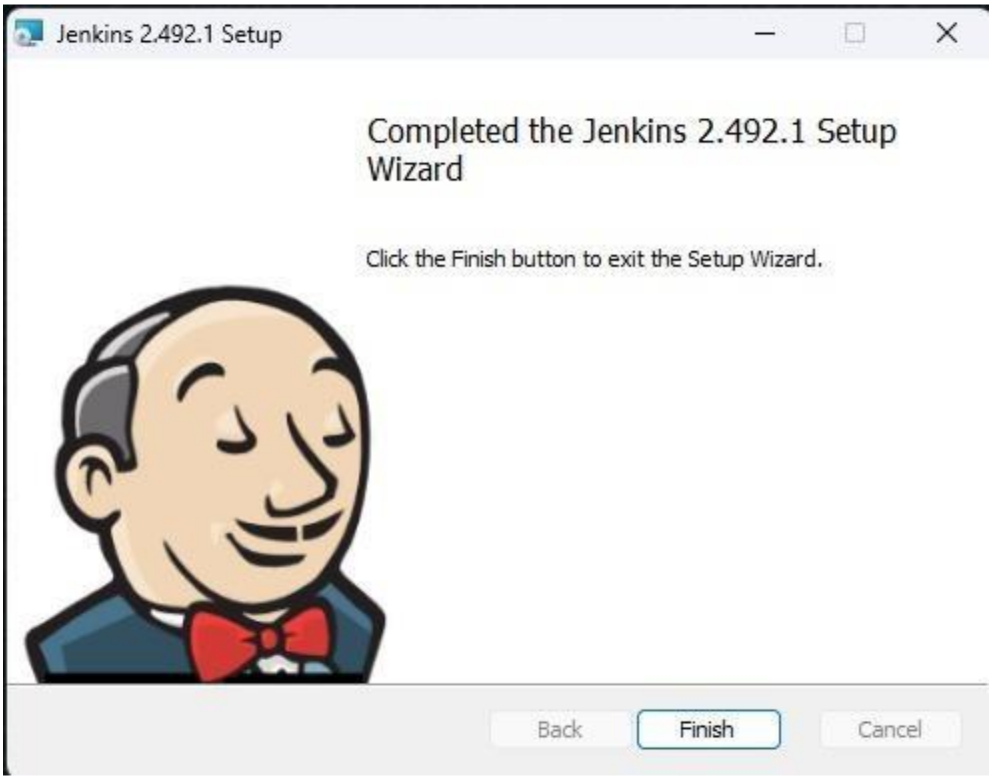
The required Jenkins components

This feature requires 92MB on your hard drive. It has 1 of 2 subfeatures selected. The subfeatures require 0KB on your hard drive.



Welcome to the Jenkins 2.492.1 Setup Wizard

The Setup Wizard will install Jenkins 2.492.1 on your computer. Click Next to continue or Cancel to exit the Setup Wizard.



Completed the Jenkins 2.492.1 Setup Wizard

Click the Finish button to exit the Setup Wizard.

Conclusion

Thus, we have successfully installed Jenkins and configure with maven/gradle/ant.