Experiment 4 : To understand Continuous Integration, install and configure Jenkins with Maven/Ant/Gradle to set up a build job.

Aim : To understand the concept of **Continuous Integration (CI)** and implement it by installing and configuring **Jenkins** with **Maven, Ant, or Gradle** to automate the build process. This study aims to explore how Jenkins helps in setting up a CI pipeline, executing automated builds, and improving software development efficiency.

Theory :

Theory of Continuous Integration Using Jenkins with Maven, Ant, or Gradle

Introduction to Continuous Integration (CI)

Continuous Integration (CI) is a **software development practice** where developers frequently integrate their code changes into a shared repository. Each integration is verified using **automated builds and tests**, ensuring that issues are detected early. CI helps streamline the development process, reduces manual errors, and improves software quality.

Key principles of CI:

1. **Frequent Code Integration** – Developers merge changes multiple times a day.
2. **Automated Build Process** – Code is compiled, built, and tested automatically.
3. **Immediate Feedback** – Issues are detected early and fixed promptly.
4. **Consistent Environment** – CI ensures that software builds are reproducible across different environments.

To implement Continuous Integration, organizations use **CI tools like Jenkins**, which automates the build, test, and deployment process.

Jenkins: A CI/CD Automation Tool

Jenkins is an open-source **automation server** that enables developers to **automate software builds, tests, and deployments**. It supports integration with version control systems (Git, SVN) and build tools like **Maven, Ant, and Gradle**.

Key Features of Jenkins

- **Automated Builds:** Supports scheduled or triggered builds based on repository changes.

- **Build Pipelines:** Allows chaining multiple jobs for end-to-end automation.
- **Plugin Support:** Offers 1,500+ plugins for integration with tools like Docker, Kubernetes, and Slack.
- **Scalability:** Can distribute builds across multiple nodes for faster execution.

Build Tools: Maven, Ant, and Gradle

Build tools are essential in CI to **compile source code, resolve dependencies, and generate deployable artifacts**.

1. Apache Maven

- A widely used **Java-based build automation tool**.
- Uses **POM.xml (Project Object Model)** to define project dependencies, build lifecycle, and plugins.
- Supports phases like **clean, compile, test, package, install, and deploy**.
- Command to build a project:
- mvn clean install

2. Apache Ant

- **Older than Maven**, but still used for Java builds.

- Uses an **XML-based build script (build.xml)** to define tasks.
- More flexible but requires explicit configurations.
- Command to execute a build:
- ant build

3. Gradle

- **Newer build tool**, used for **Java, Kotlin, and Android development**.
- Uses a **Groovy or Kotlin-based build script** instead of XML.
- Faster than Maven due to its **incremental build mechanism**.
- Command to build a project:
- gradle build

Jenkins Integration with Maven, Ant, and Gradle

Jenkins can be configured to **automate builds** using these tools. The integration process involves:

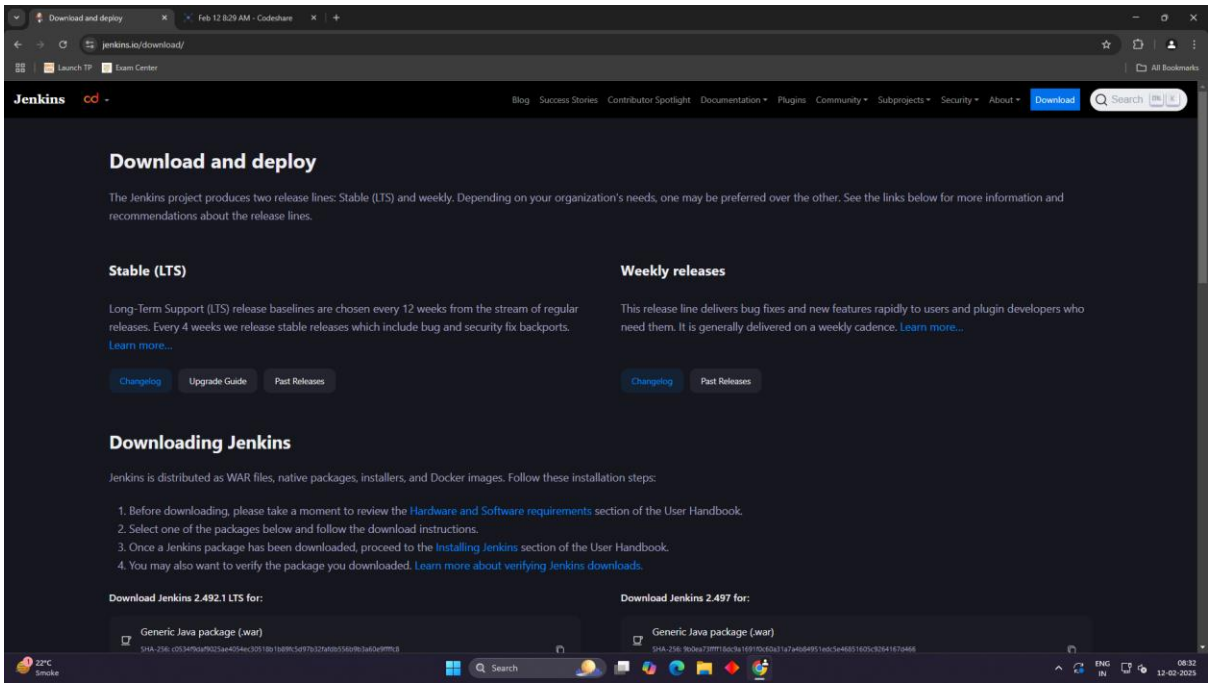
1. **Installing Jenkins** and setting up build tools.
2. **Creating a job in Jenkins** that fetches source code from Git.

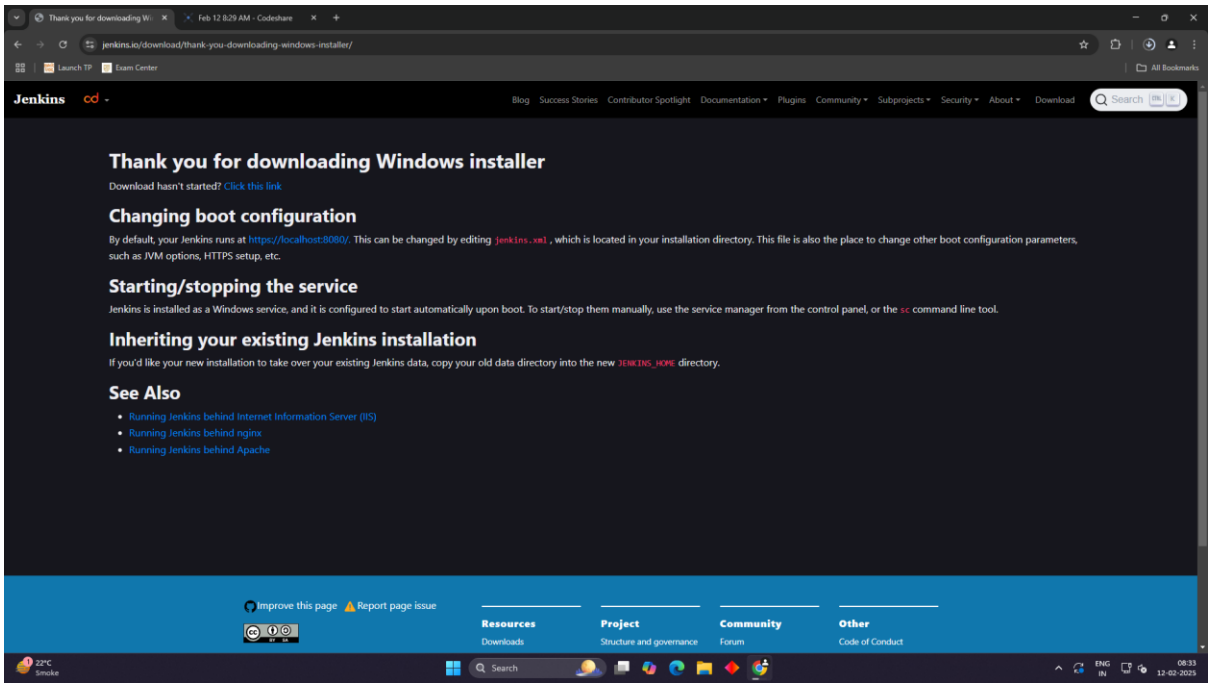
3. **Configuring build steps** to invoke Maven, Ant, or Gradle commands.
4. **Executing automated builds** and monitoring results.

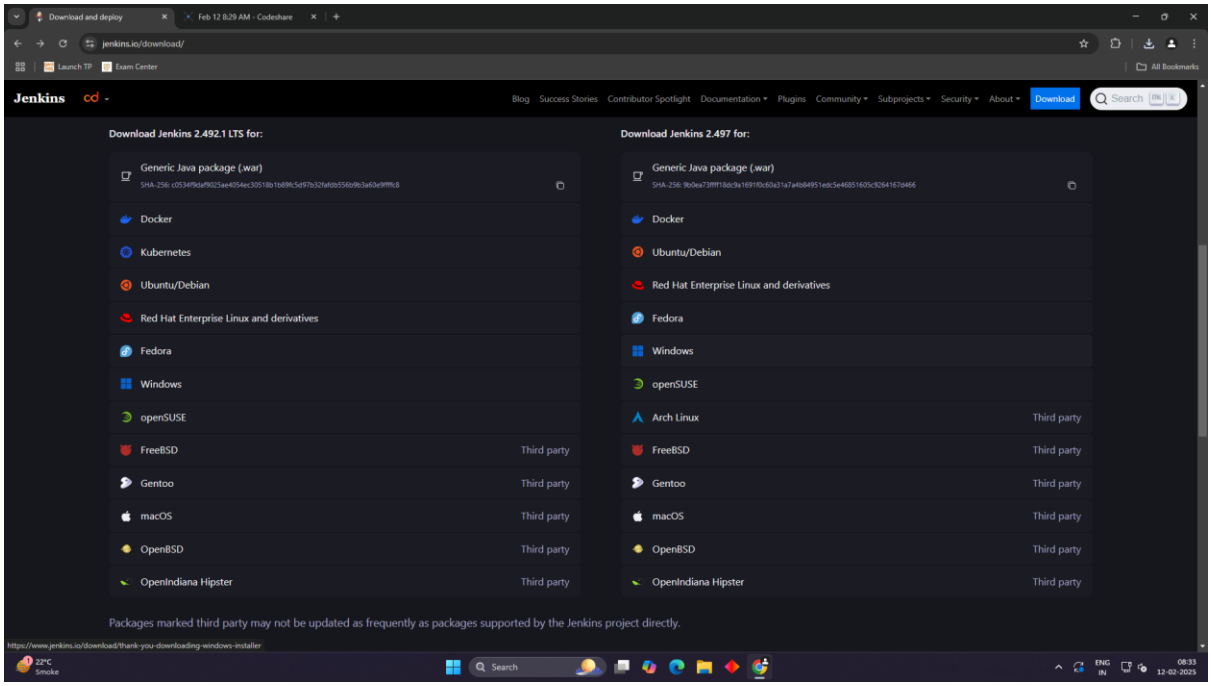
Advantages of Using Jenkins for CI

- **Faster Development Cycle** – Automated builds and testing reduce manual effort.
- **Early Bug Detection** – Continuous integration ensures quick issue identification.
- **Improved Collaboration** – Developers work on the latest stable codebase.
- **Efficient Deployment** – Jenkins supports integration with **Docker, Kubernetes, and cloud platforms**.

Implementation :



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Download Jenkins 2.492.1 LTS for:
Generic Java package (.war)
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Kubernetes
Ubuntu/Debian
Red Hat Enterprise Linux and derivatives
Fedora
Windows
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FreeBSD Third party
Gentoo Third party
macOS Third party
OpenBSD Third party
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FreeBSD Third party
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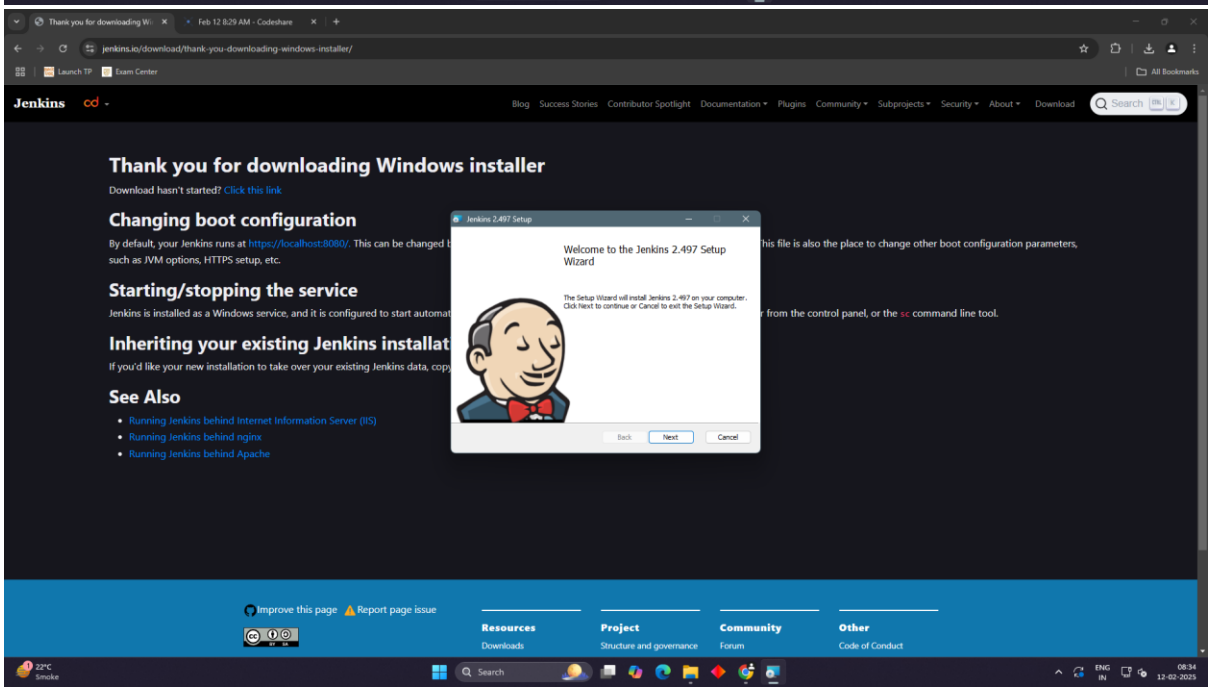
macOS Third party
OpenBSD Third party
OpenIndiana Hipster Third party
Packages marked third party may not be updated as frequently as packages supported by the Jenkins project directly.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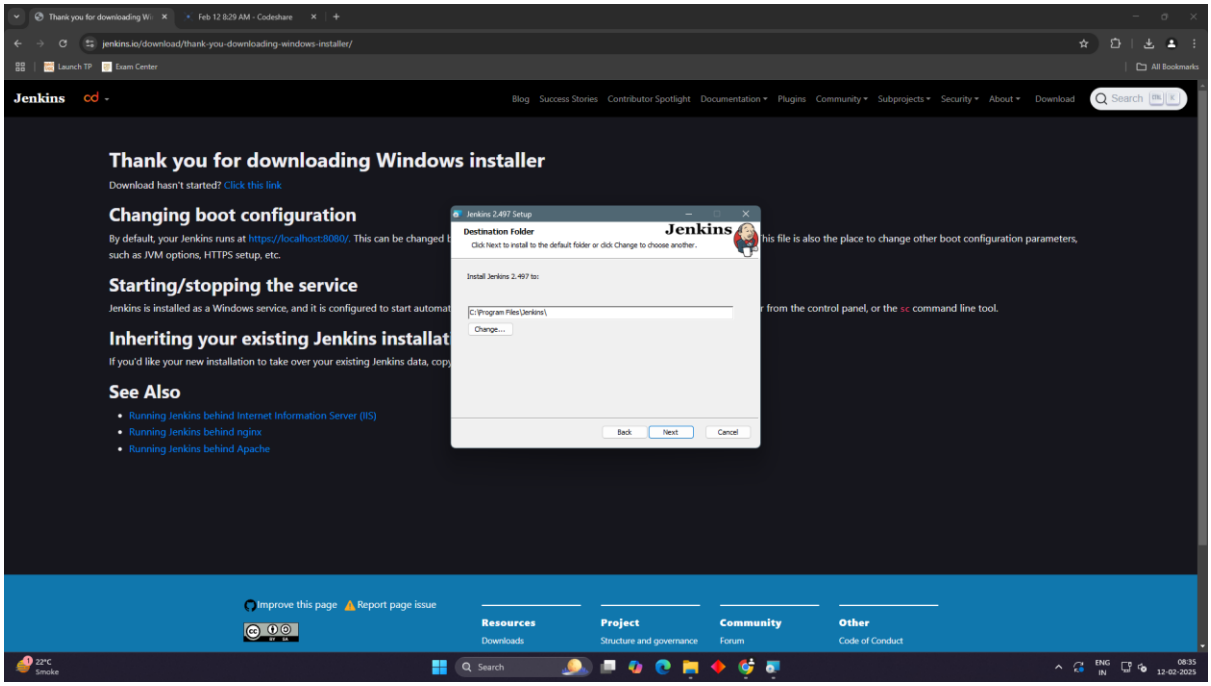
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Destination Folder
Install Jenkins 2.497 to:
C:\Program Files\Jenkins\
Change...
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Next
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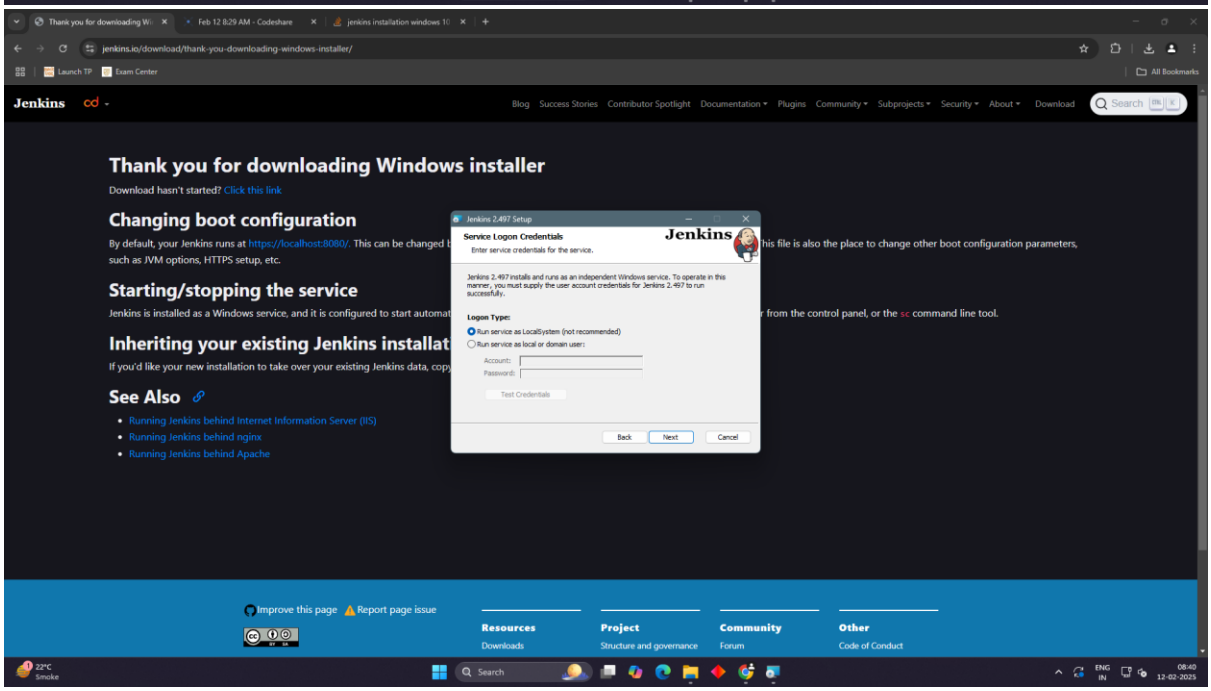
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Service Logon Credentials
Enter service credentials for the service.
Jenkins 2.497 installs and runs as an independent Windows service. To operate in this manner, you must supply the user account credentials for Jenkins 2.497 to run successfully.
Logon Type:
Run service as LocalSystem (not recommended)
Run service as local or domain user:
Account:
Password:
Test Credentials
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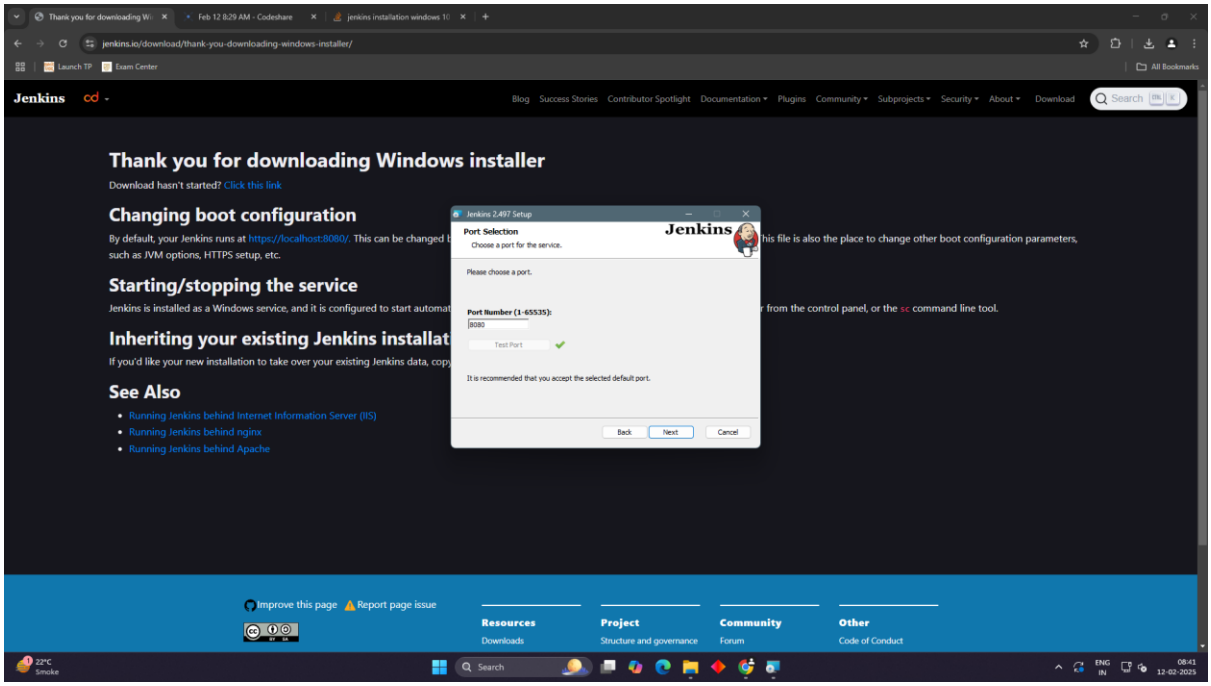
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Port Selection
Choose a port for the service.
Please choose a port.
Port Number (1-65535):
8080
Test Port
It is recommended that you accept the selected default port.
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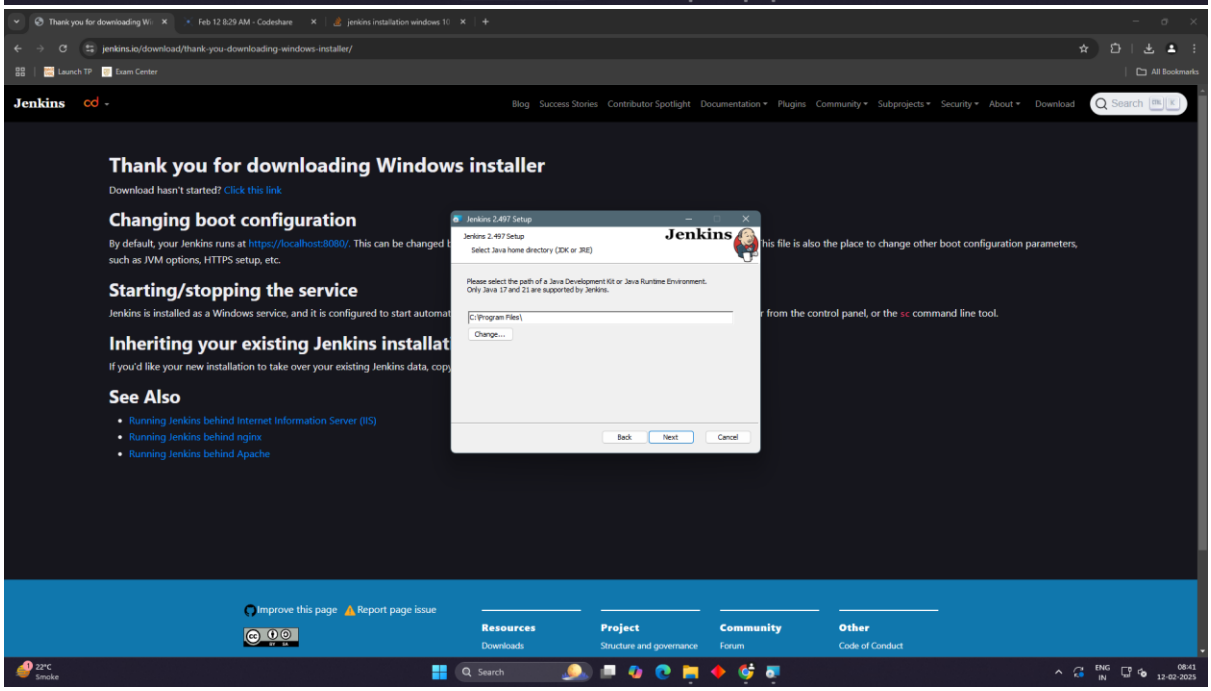
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Select Java home directory (JDK or JRE)
Please select the path of a Java Development Kit or Java Runtime Environment.
Only Java 17 and 21 are supported by Jenkins.
C:\Program Files\
Change...
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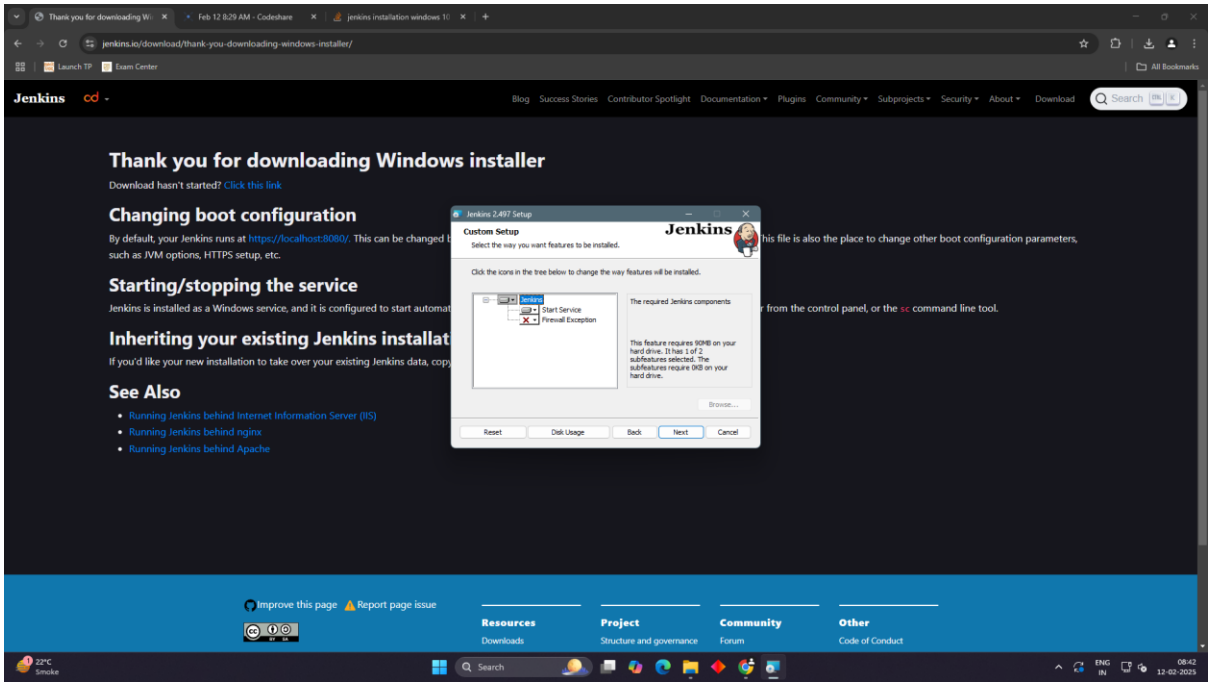
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Jenkins 2.497 Setup
Custom Setup
Select the way you want features to be installed.
Click the icons in the tree below to change the way features will be installed.
Start Service
Firewall Exception
The required Jenkins components
Reset
Disk Usage
Back
Next
Cancel
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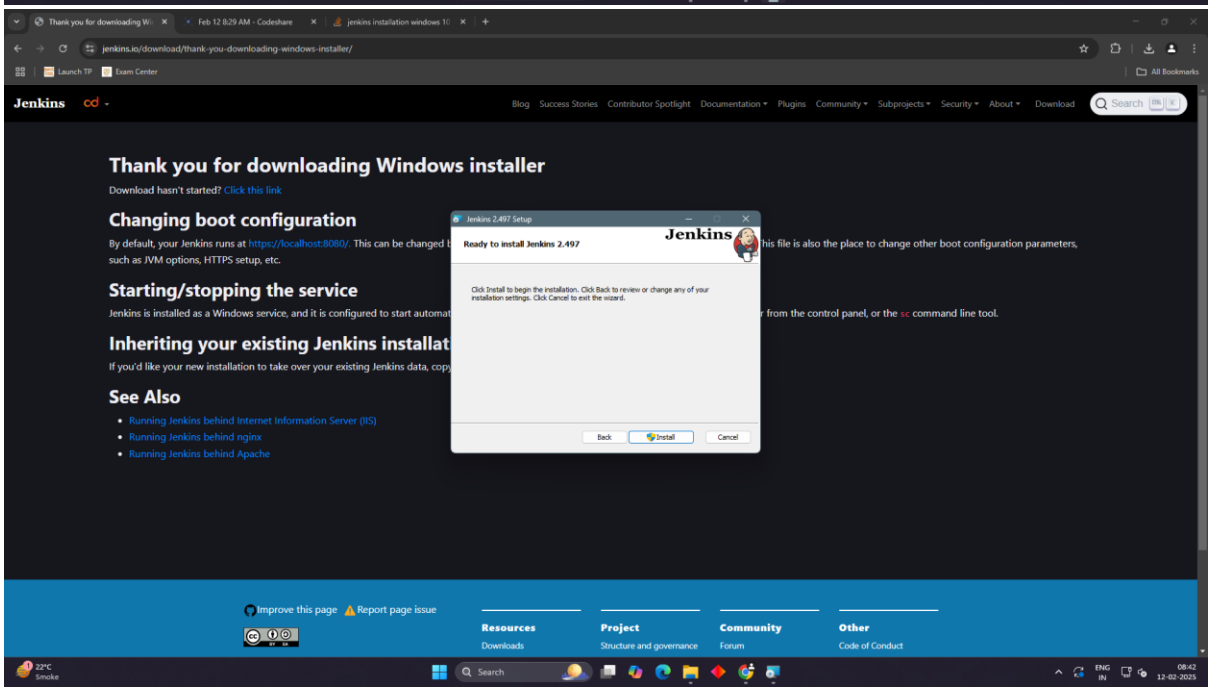
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Ready to install Jenkins 2.497
Click Install to begin the installation. Click Back to review or change any of your installation settings. Click Cancel to exit the wizard.
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Install
Cancel
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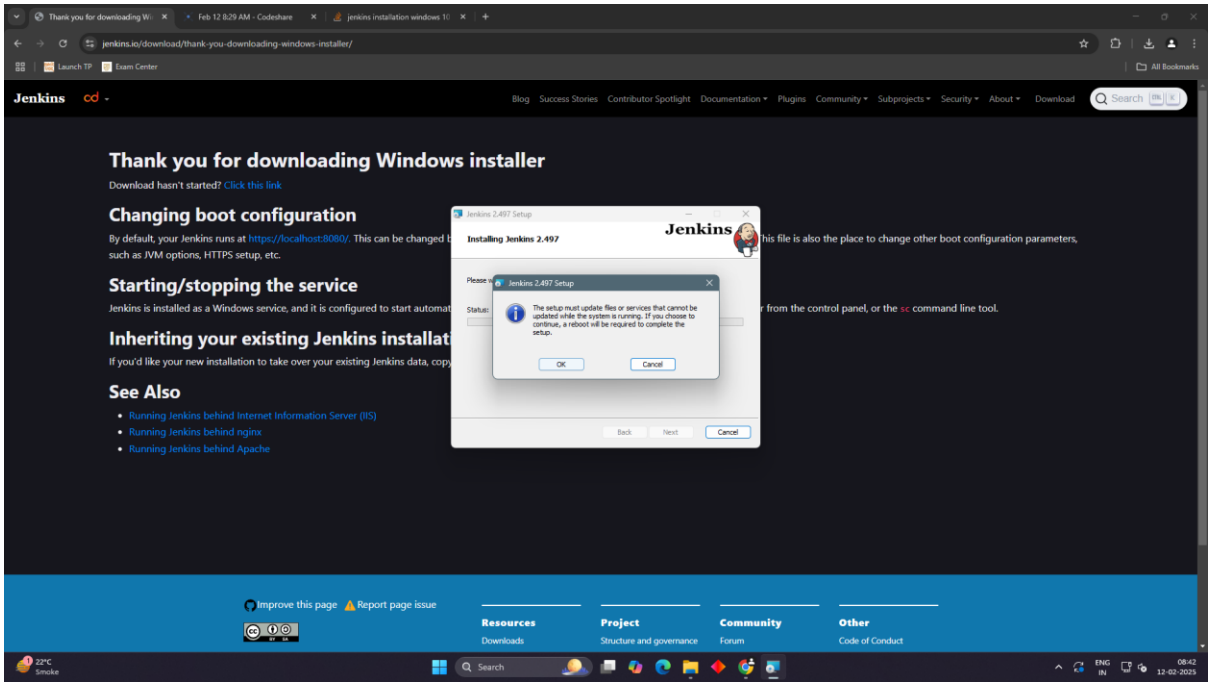
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Installing Jenkins 2.497
The setup must update files or services that cannot be updated while the system is running. If you choose to continue, a reboot will be required to complete the setup.
OK
Cancel
Back
Next
Cancel
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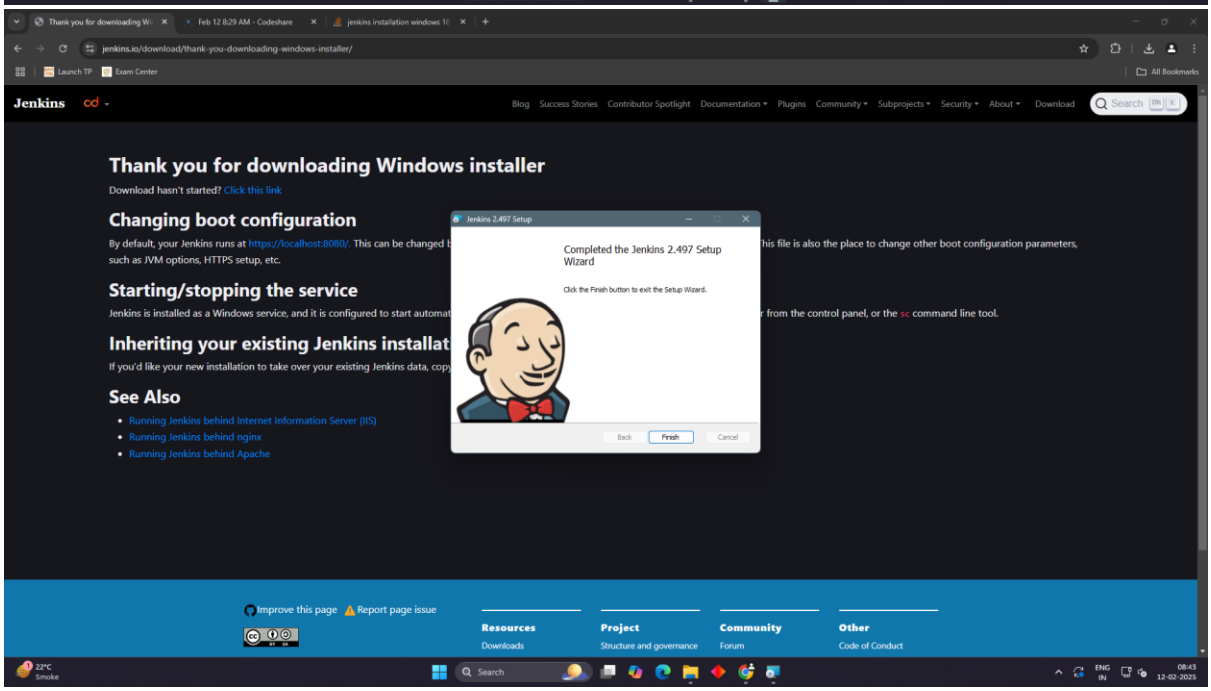
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Completed the Jenkins 2.497 Setup Wizard
Click the Finish button to exit the Setup Wizard.
Back
Finish
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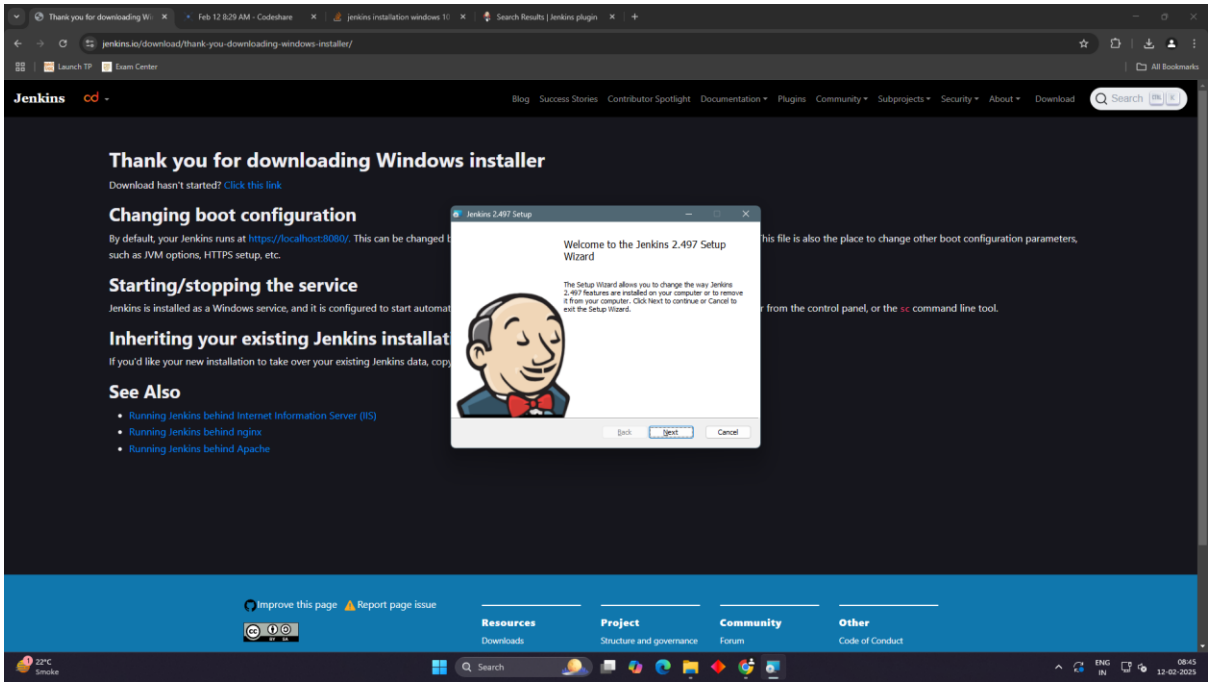
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Running Jenkins behind Apache
Jenkins 2.497 Setup
Welcome to the Jenkins 2.497 Setup Wizard
The Setup Wizard allows you to change the way Jenkins 2.497 features are installed on your computer or to remove it from your computer. Click Next to continue or Cancel to exit the Setup Wizard.
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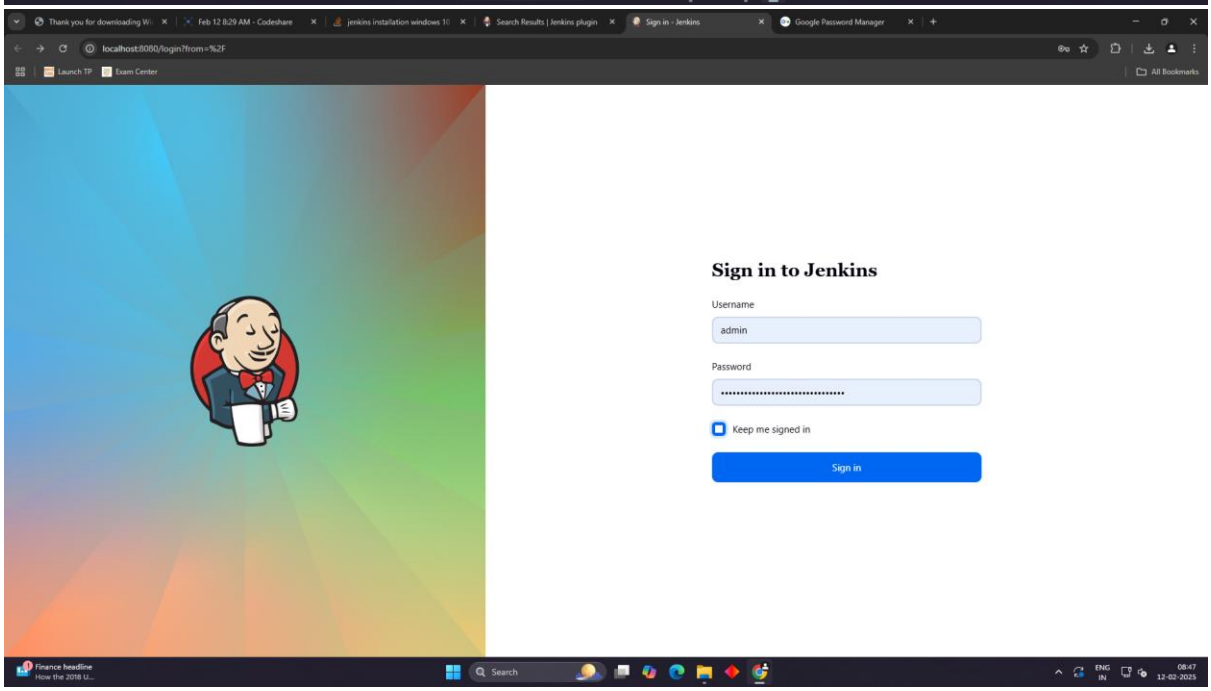
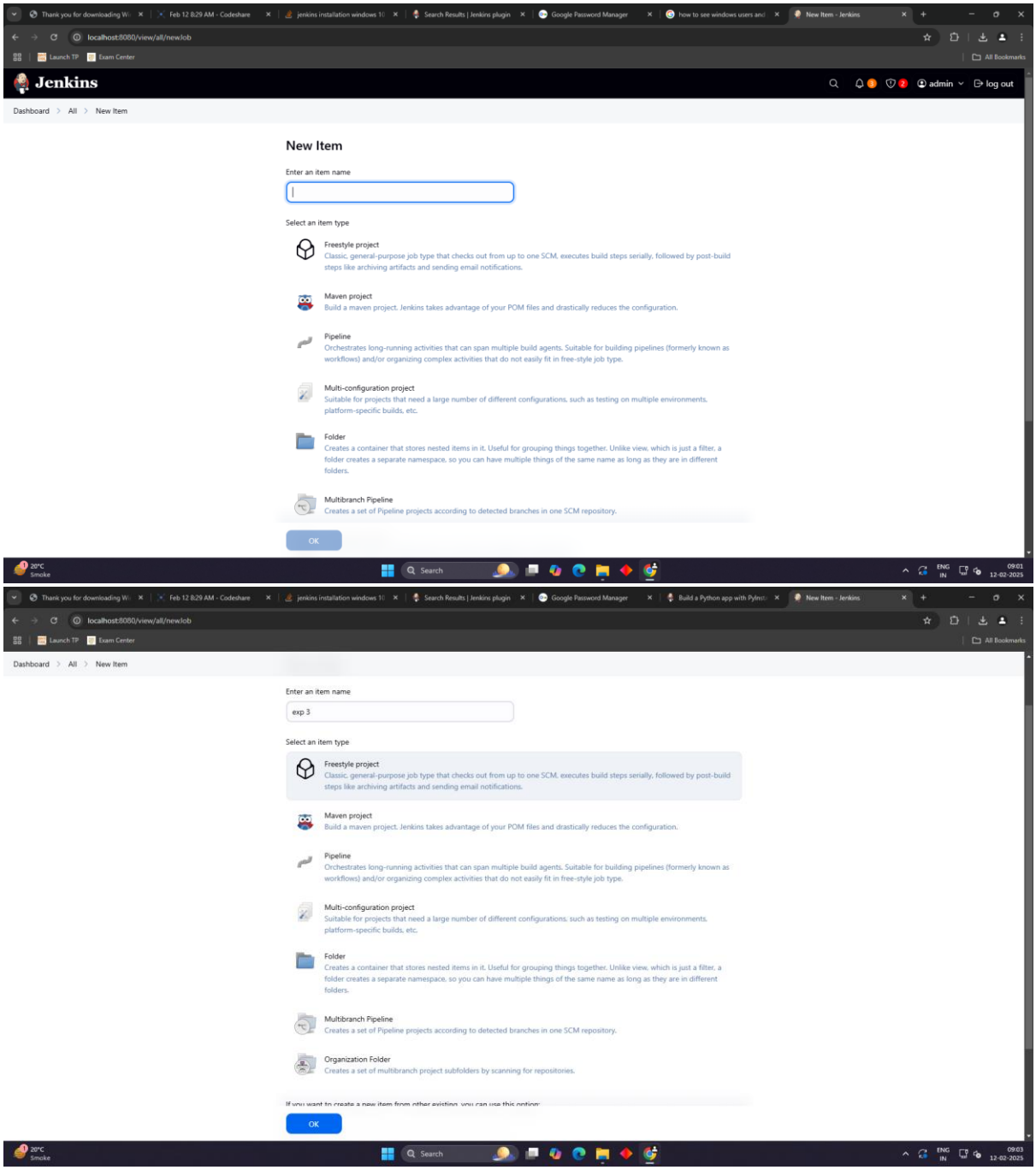

Sign in to Jenkins
Username
admin
Password
Keep me signed in
Sign in



Conclusion : Thus we have successfully installed and configured Jenkins.