Deploy java applications

Java Archive (Jar) files

- fundamental packaging format in Java.
- used to **aggregate and compress multiple files into a single archive**,
- distribute and deploy Java applications.

https://naveen-metta.medium.com/demystifying-jar-fat-jar-war-and-ear-files-in-java-d6802af9beda

JAR file

- simply ZIP files that contain all of the resources required to run a Java application.
- A JAR file typically contains:
  - Java source files
  - Property files
  - XML files
  - Image files
  - A manifest file

https://www.theserverside.com/blog/Coffee-Talk-Java-News-Stories-and-Opinions/Run-JAR-file-example-windows-linux-ubuntu

Manifest.mf

- Text file located in the jar META-INF/MANIFEST.MF

```
Manifest-Version: 1.0
Created-By: 1.7.0_06 (Oracle Corporation)
Main-Class: MyPackage.MyClass
```

- Can define which class will be executed

```
java -jar MyJar.jar
```

- It will exec MyPackage.Myclass within MyJar.java

https://docs.oracle.com/javase/tutorial/deployment/jar/manifestindex.html

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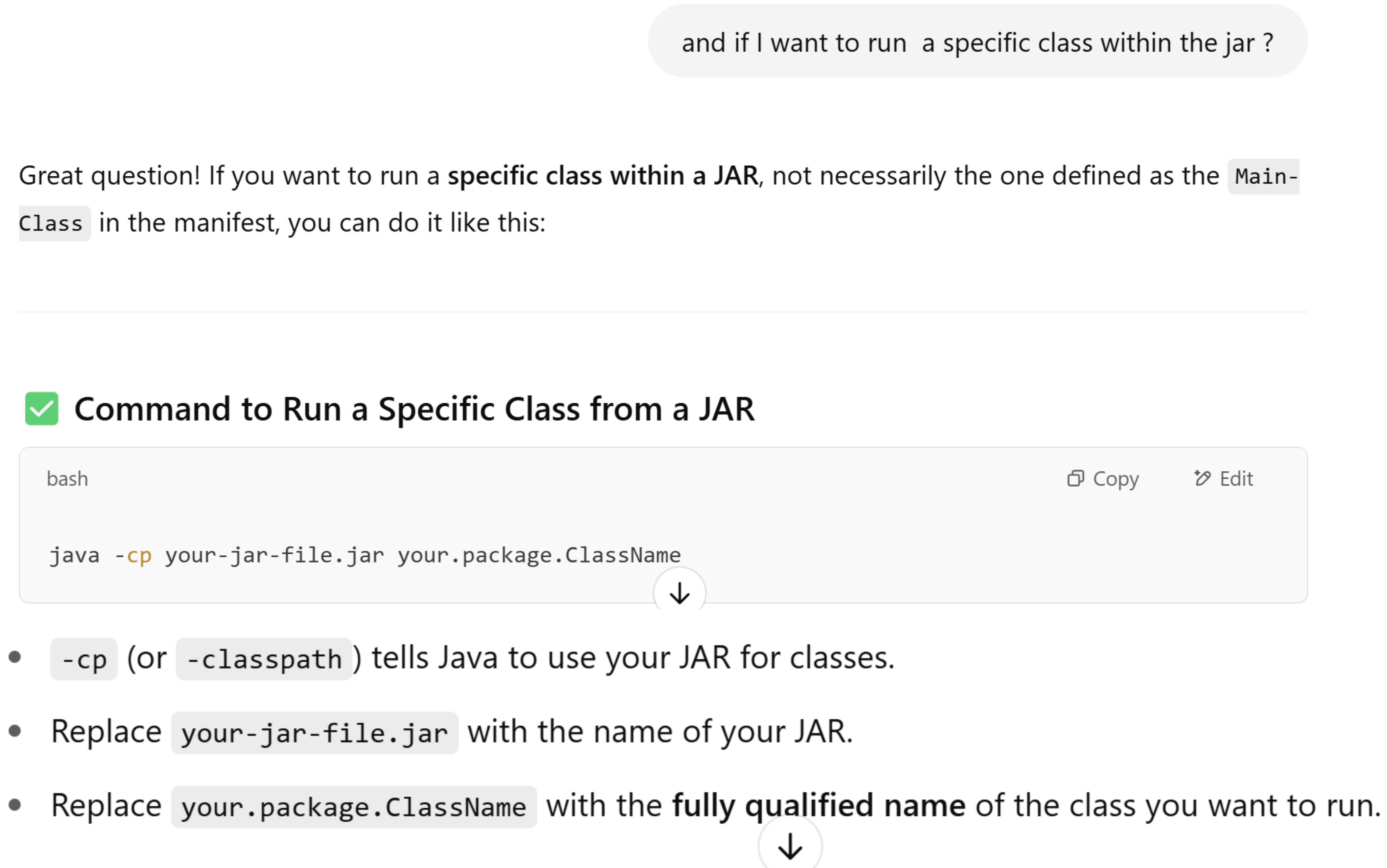
If I want to run a specific class?



and if I want to run a specific class within the jar ?

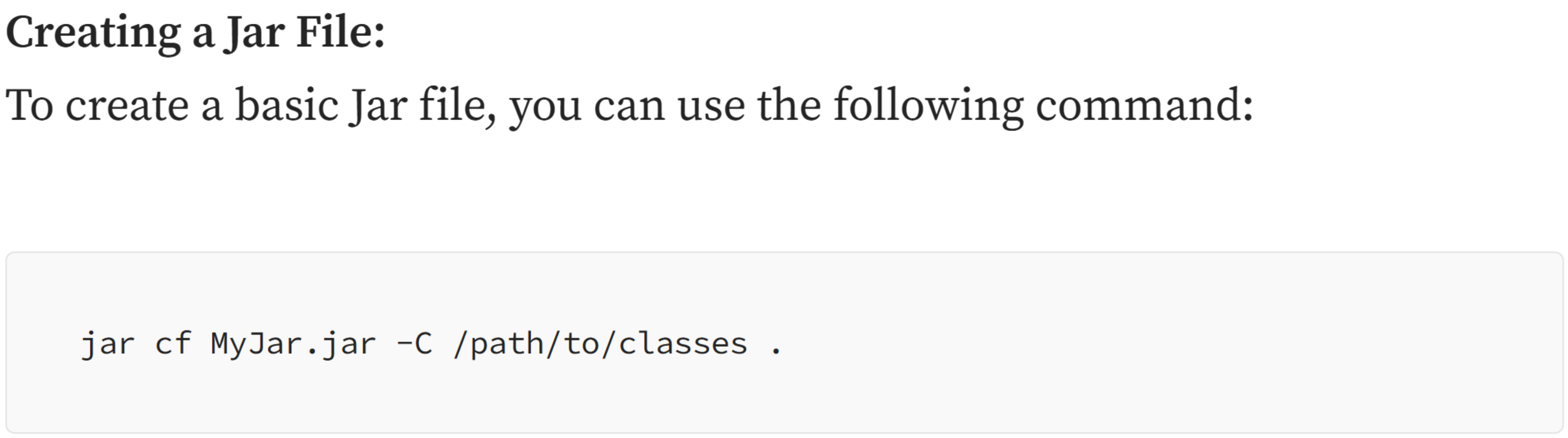
Great question! If you want to run a **specific class within a JAR**, not necessarily the one defined as the `Main-Class` in the manifest, you can do it like this:

✅ Command to Run a Specific Class from a JAR

```bash
java -cp your-jar-file.jar your.package.ClassName
```

- `-cp` (or `-classpath`) tells Java to use your JAR for classes.
- Replace `your-jar-file.jar` with the name of your JAR.
- Replace `your.package.ClassName` with the **fully qualified name** of the class you want to run.

Creating a jar manually



Creating a Jar File:

To create a basic Jar file, you can use the following command:

```
jar cf MyJar.jar -C /path/to/classes .
```

More details on jar command

https://docs.oracle.com/javase/tutorial/deployment/jar/manifestindex.html
https://joshiadvait8.medium.com/how-to-create-jar-file-easy-way-of-jar-from-java-files-b8c916ab291e

Jar commands: some examples

- Run a JAR file
    - `jar -jar jarfilename.jar`
- Create a JAR file
    - `jar cf jarfiletocreate.jar file-list`
- Open a JAR file
    - `jar xf jar-file-to-open.jar`
- Run a JAR without a manifest
    - `java -cp jarfilename.jar com.exa`

More details on jar command

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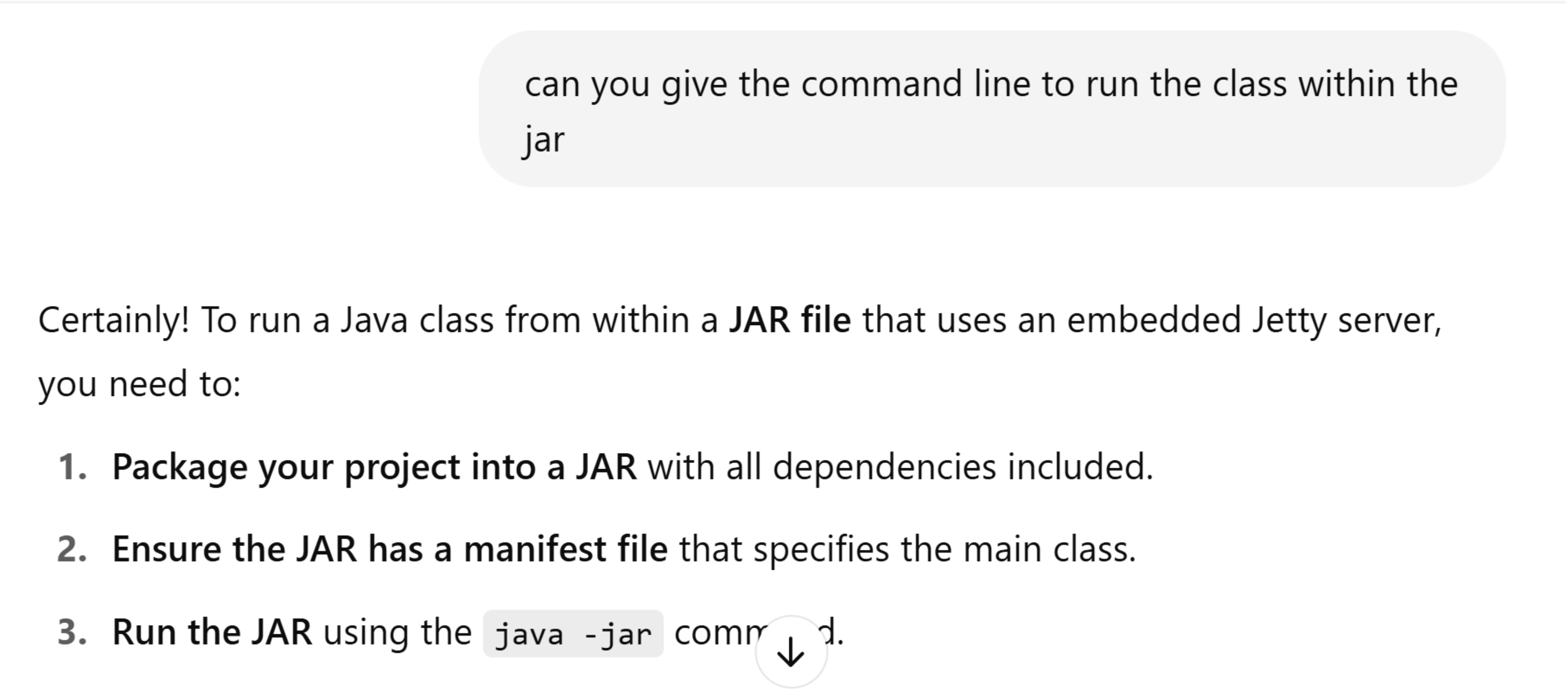
https://joshiadvait8.medium.com/how-to-create-jar-file-easy-way-of-jar-from-java-files-b8c916ab291e

Asked the chatGPT…



can you give the command line to run the class within the jar

Certainly! To run a Java class from within a **JAR file** that uses an embedded Jetty server, you need to:

1. **Package your project into a JAR** with all dependencies included.
2. **Ensure the JAR has a manifest file** that specifies the main class.
3. **Run the JAR** using the `java -jar` comm d.

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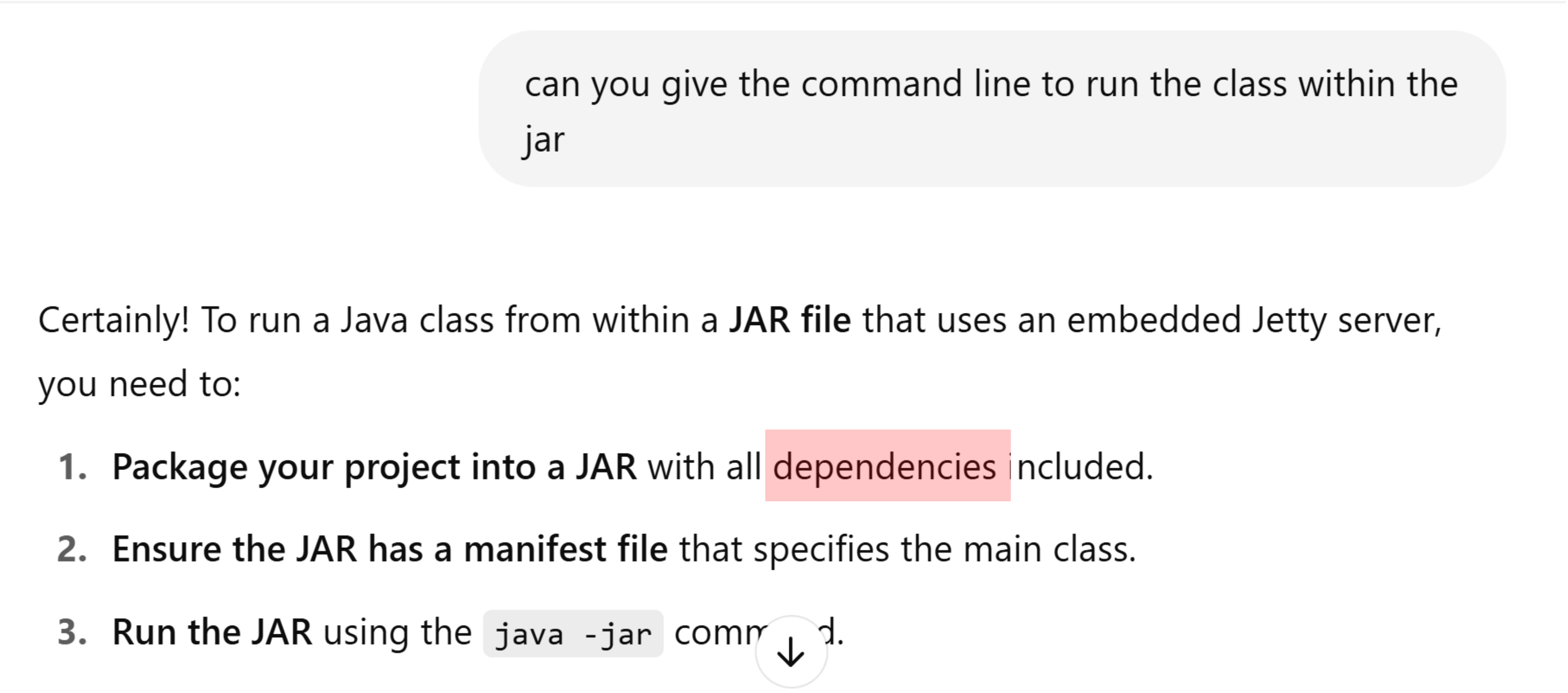

can you give the command line to run the class within the jar

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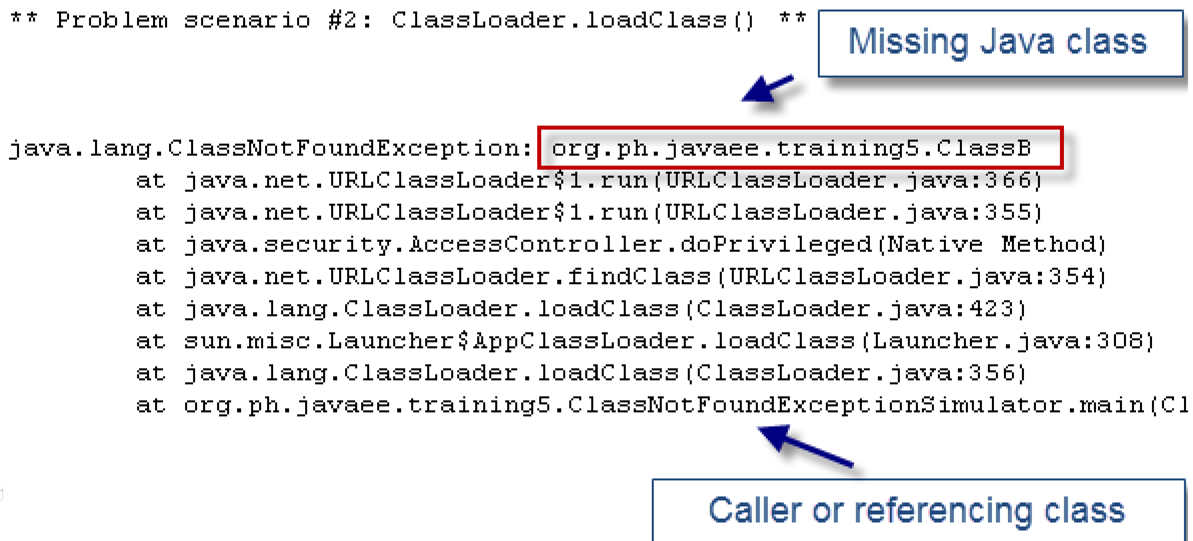
Dependencies in java

- External Java libraries required for Project
  - Can be jars
  - Managed by user
- Must be within execution classpath and or Jar
- If not we get ClassNotFoundException



```
** Problem scenario #2: ClassLoader.loadClass() **


java.lang.ClassNotFoundException: org.ph.javaee.training5.ClassB
        at java.net.URLClassLoader$1.run(URLClassLoader.java:366)
        at java.net.URLClassLoader$1.run(URLClassLoader.java:355)
        at java.security.AccessController.doPrivileged(Native Method)
        at java.net.URLClassLoader.findClass(URLClassLoader.java:354)
        at java.lang.ClassLoader.loadClass(ClassLoader.java:423)
        at sun.misc.Launcher$AppClassLoader.loadClass(Launcher.java:308)
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        at org.ph.javaee.training5.ClassNotFoundExceptionSimulator.main(Cl
```

Missing Java class

Caller or referencing class

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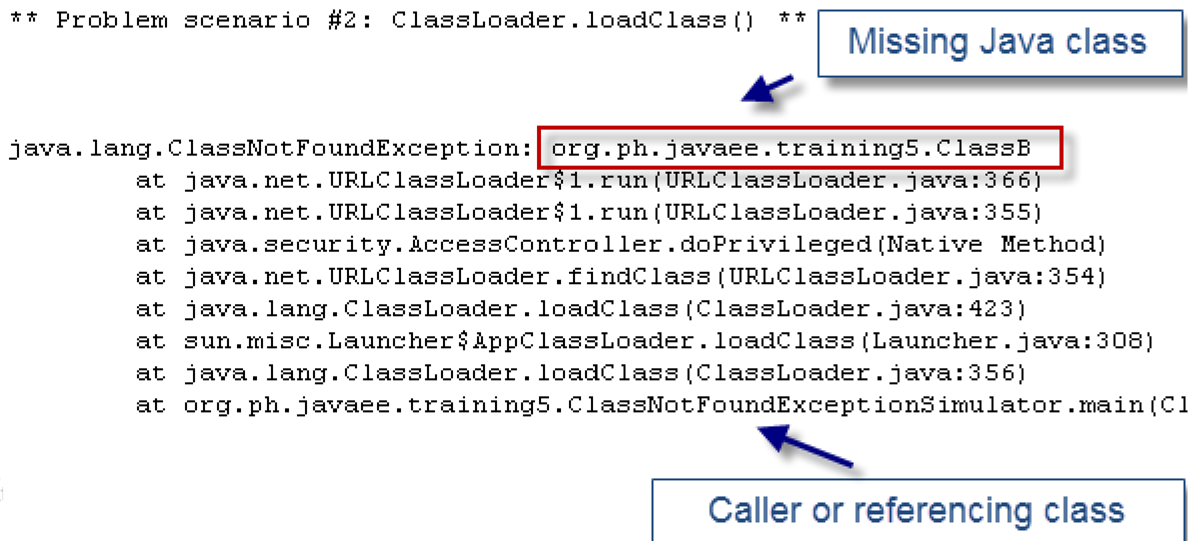

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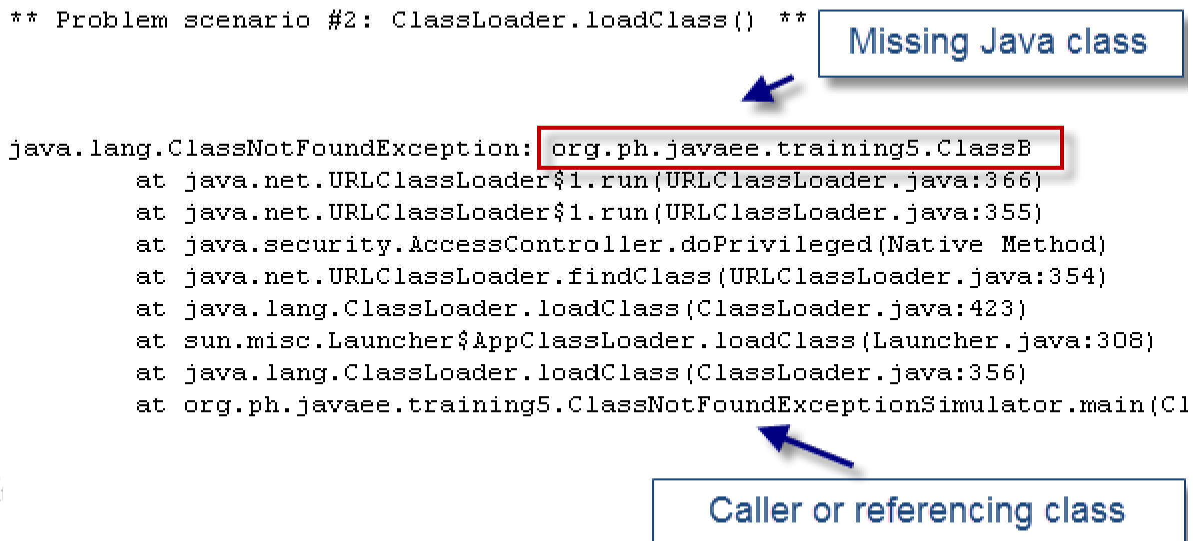

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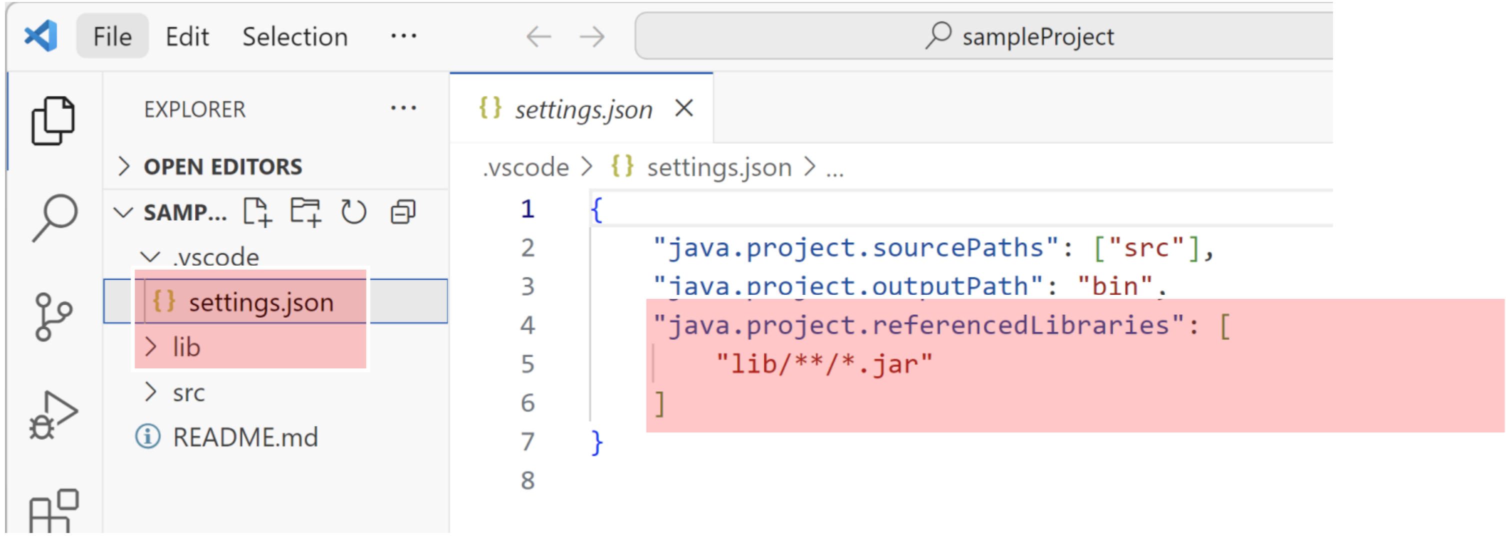
```

In default java projects in VSCode

- Place dependencies jar in
  - <project>/libs (default)
  - Path within settings.json field
    - `"java.project.referencedLibraries"`



```json
{
    "java.project.sourcePaths": ["src"],
    "java.project.outputPath": "bin",
    "java.project.referencedLibraries": [
        "lib/**/*.jar"
    ]
}

```

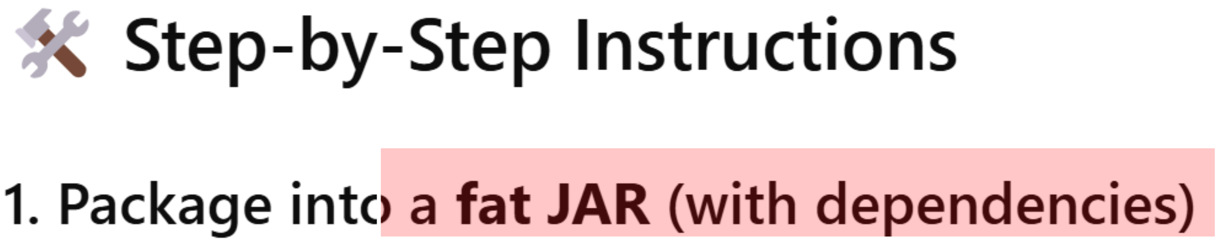
https://code.visualstudio.com/docs/java/java-project
https://www.baeldung.com/java-visual-studio-code-add-jar

Create jar with dependencies

🛠️ Step-by-Step Instructions

1. Package into a **fat JAR** (with dependencies)

Create jar with dependencies



🛠️ Step-by-Step Instructions

1. Package into a **fat JAR** (with dependencies)

Fat Jar Files

- include **all dependencies within the archive**.
    - self-contained approach
    - simplifies deployment,
    - as the application can be run **without relying on external libraries.**
- Also referred as Uber Jars or executable Jars,

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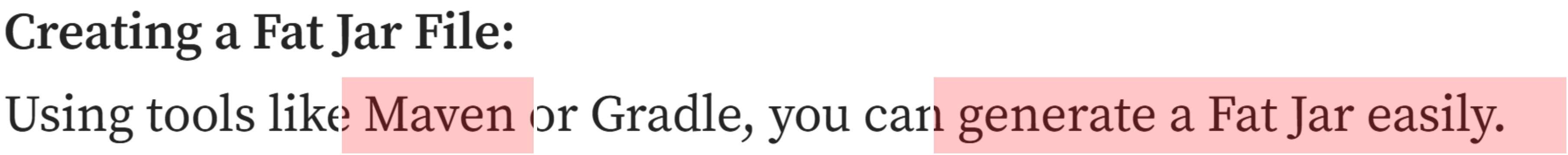


Creating a Fat Jar File:

Using tools like Maven or Gradle, you can generate a Fat Jar easily.

Maven™

- software project management and comprehension tool. Based on the concept of a project object model (POM), Maven can manage a project's build, reporting and documentation from a central piece of information.

Apache Maven Project
http://maven.apache.org/

https://maven.apache.org/

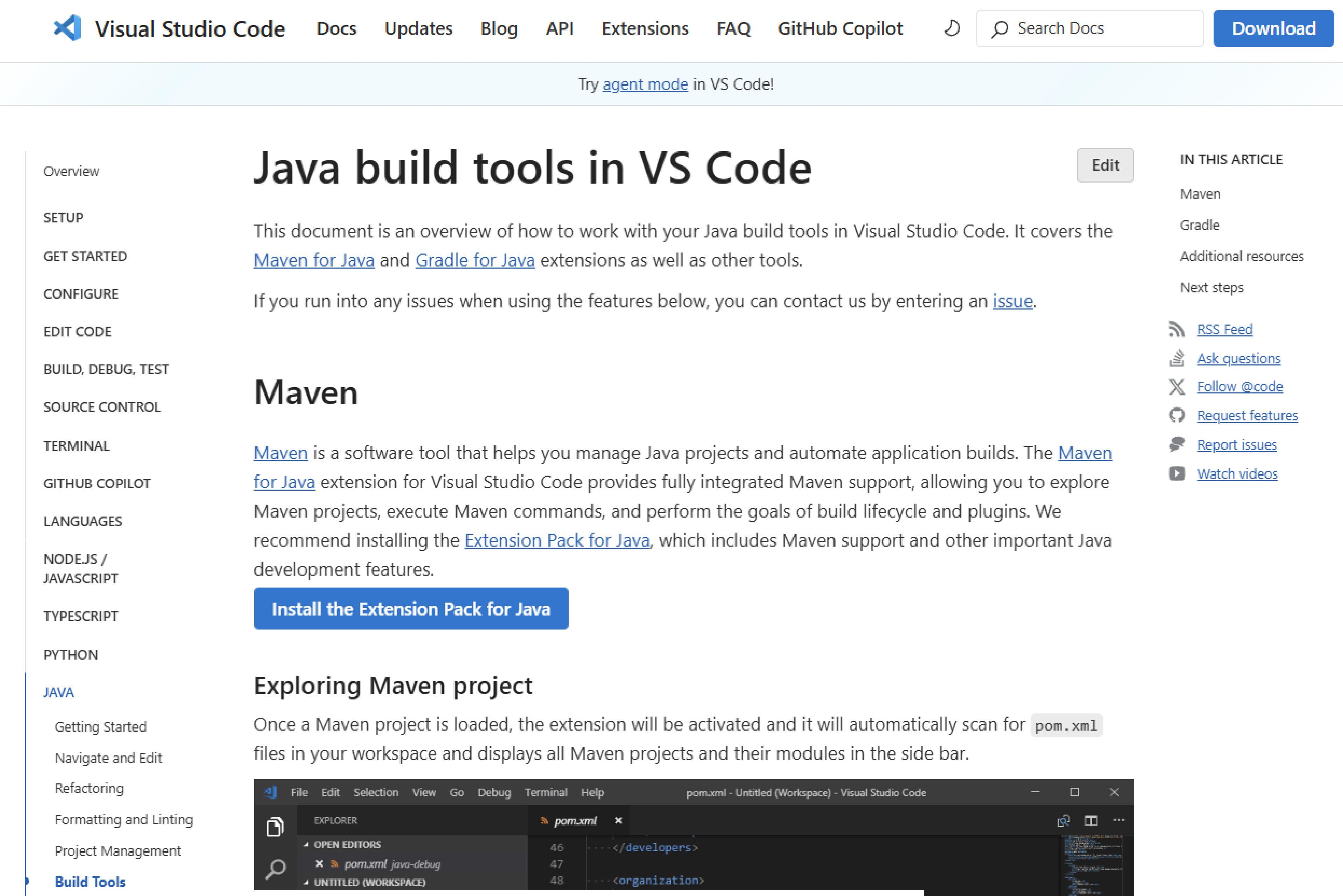
What is Maven Used For?

- **easily build a project using maven.**
- **add jars and other dependencies of the project easily using the help of maven.**
- Maven is very helpful for a project while **updating the central repository of JARs and other dependencies**.
- With the help of Maven, **we can build any number of projects into output types like the JAR, WAR, etc** without doing any scripting.
- helps in managing the project's build lifecycle, including tasks like **compiling, testing, packaging, and deploying the code.**
- **provides a standard project structure**, making it easy for developers to understand the layout of the project and locate specific files.
- plugins can be used to add **additional functionality to the build process,** such as code coverage analysis, static code analysis, and more.
- simplifies **the process of managing project dependencies**, ensuring that the correct versions of libraries and frameworks are used throughout the project.

Why Maven in Java?

- Solves the dependency management problem.
- Downloads third-party JAR files that some apps require.
- Provides an extensive, third-party plugin architecture.
- Enables switching between development profiles.
- Integrates with DevOps tools such as Jenkins and Docker.

Hands on java with maven



Java build tools in VS Code

This document is an overview of how to work with your Java build tools in Visual Studio Code. It covers the Maven for Java and Gradle for Java extensions as well as other tools.

If you run into any issues when using the features below, you can contact us by entering an issue.

Maven

Maven is a software tool that helps you manage Java projects and automate application builds. The Maven for Java extension for Visual Studio Code provides fully integrated Maven support, allowing you to explore Maven projects, execute Maven commands, and perform the goals of build lifecycle and plugins. We recommend installing the Extension Pack for Java, which includes Maven support and other important Java development features.

Exploring Maven project

Once a Maven project is loaded, the extension will be activated and it will automatically scan for `pom.xml` files in your workspace and displays all Maven projects and their modules in the side bar.

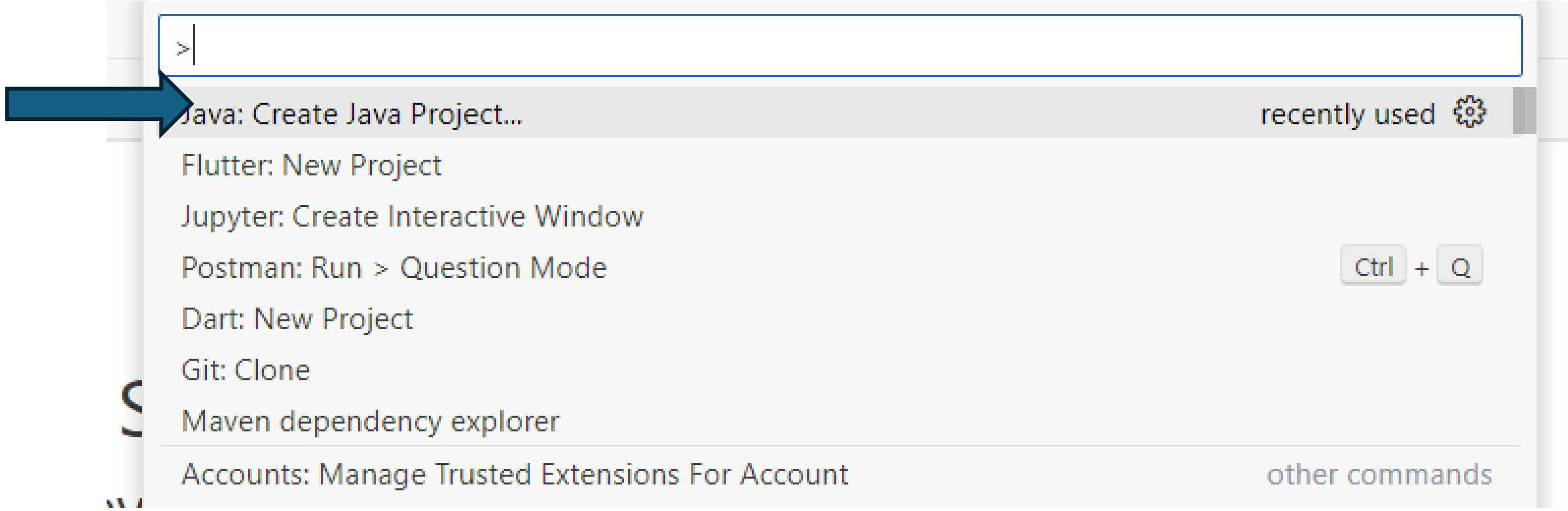
```
    </developers>

    <organization>
```

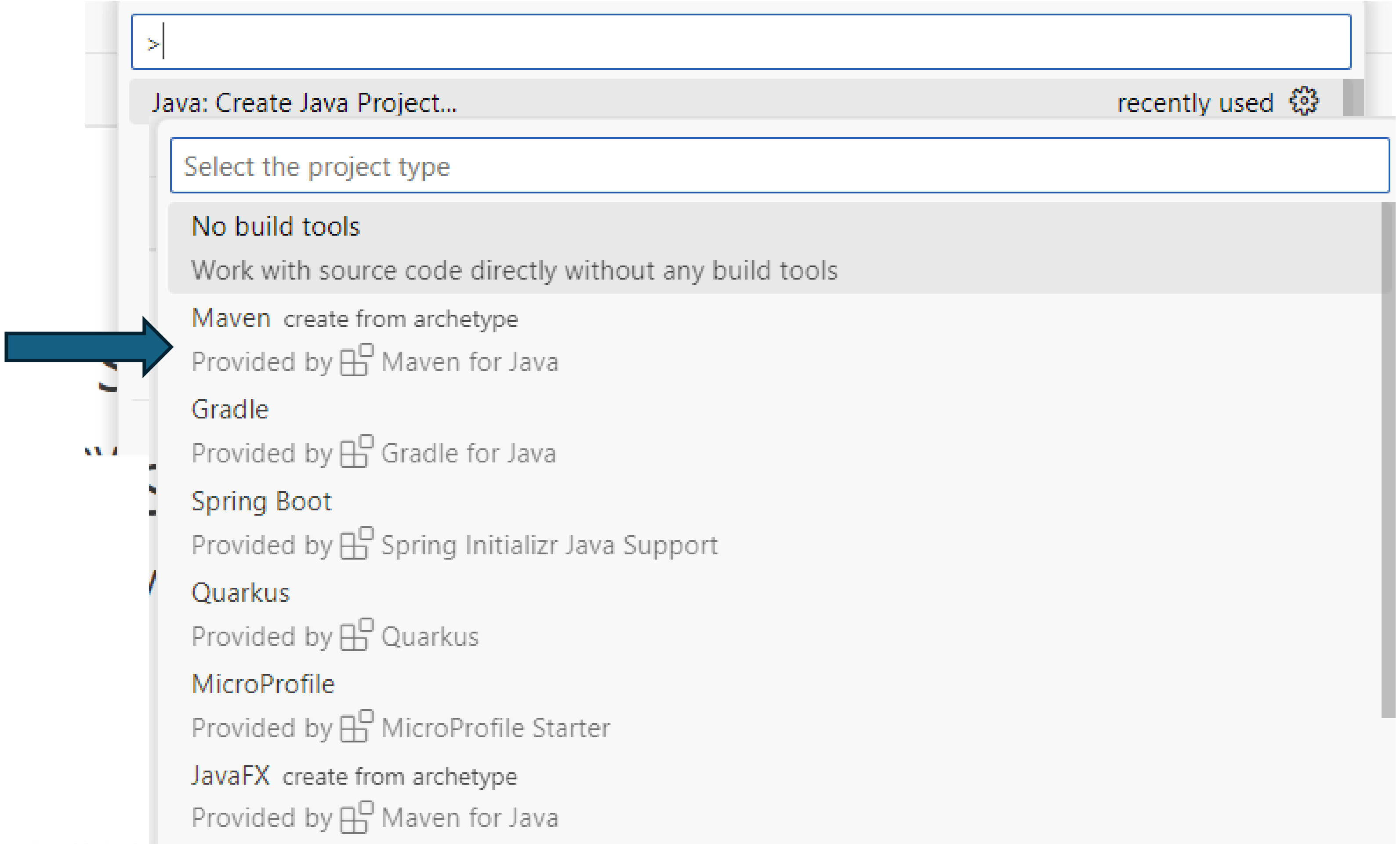
Java build tools in VS Code

https://code.visualstudio.com/docs/java/java-build

Create a project (VSCode)


>
Java: Create Java Project...
recently used
Flutter: New Project
Jupyter: Create Interactive Window
Postman: Run > Question Mode
Ctrl + Q
Dart: New Project
Git: Clone
Maven dependency explorer
Accounts: Manage Trusted Extensions For Account
other commands

Create a project (VSCode)



>

Java: Create Java Project...

Select the project type

No build tools
Work with source code directly without any build tools

Maven create from archetype
Provided by Maven for Java

Gradle
Provided by Gradle for Java

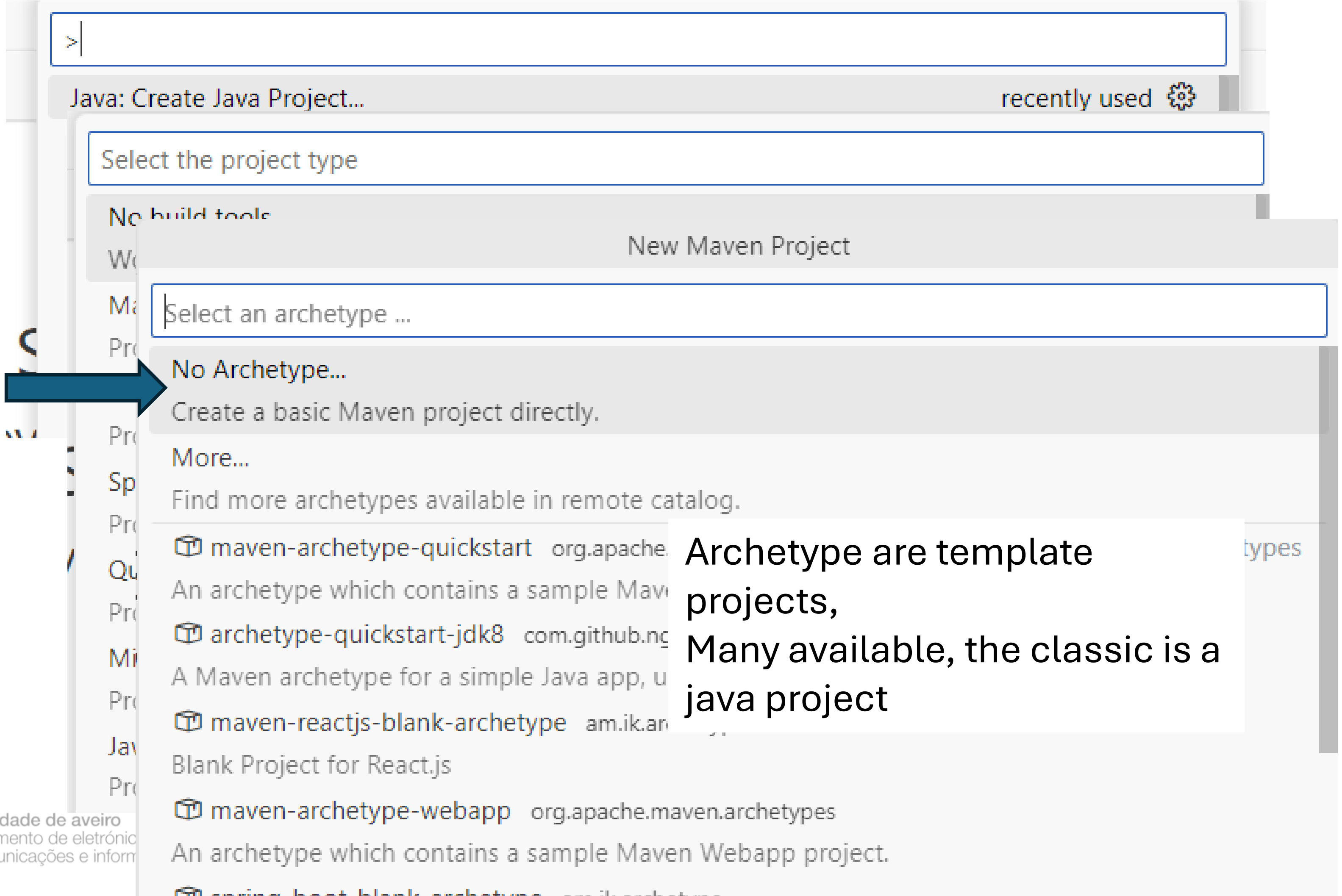
Spring Boot
Provided by Spring Initializr Java Support

Quarkus
Provided by Quarkus

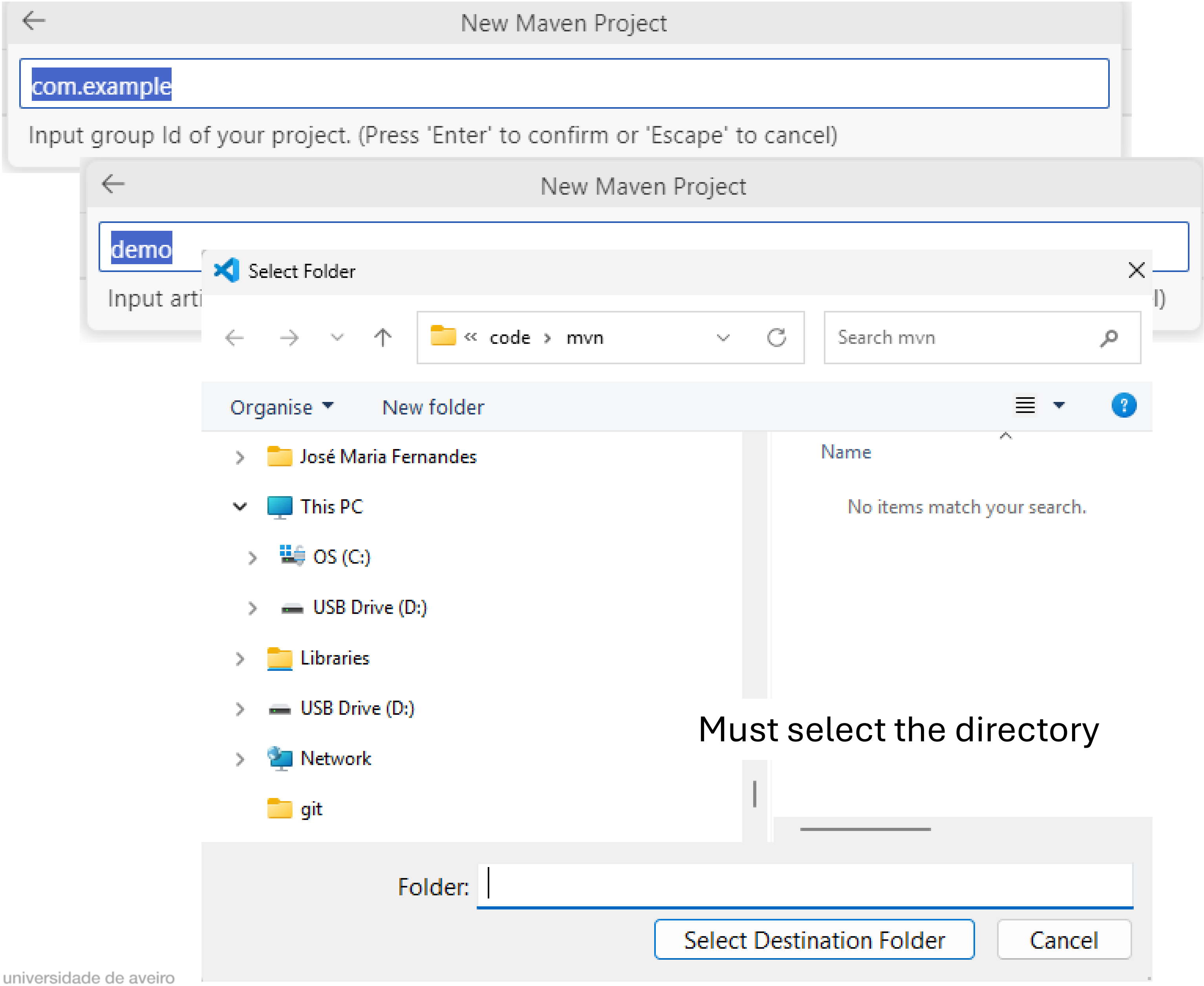
MicroProfile
Provided by MicroProfile Starter

JavaFX create from archetype
Provided by Maven for Java

Create a project (VSCode)


>|
Java: Create Java Project...
recently used
Select the project type
No build tools
New Maven Project
Select an archetype ...
No Archetype...
Create a basic Maven project directly.
More...
Find more archetypes available in remote catalog.
maven-archetype-quickstart org.apache.
An archetype which contains a sample Mav
archetype-quickstart-jdk8 com.github.ng
A Maven archetype for a simple Java app, u
maven-reactjs-blank-archetype am.ik.ar
Blank Project for React.js
maven-archetype-webapp org.apache.maven.archetypes
An archetype which contains a sample Maven Webapp project.

Archetype are template projects,
Many available, the classic is a java project



com.example

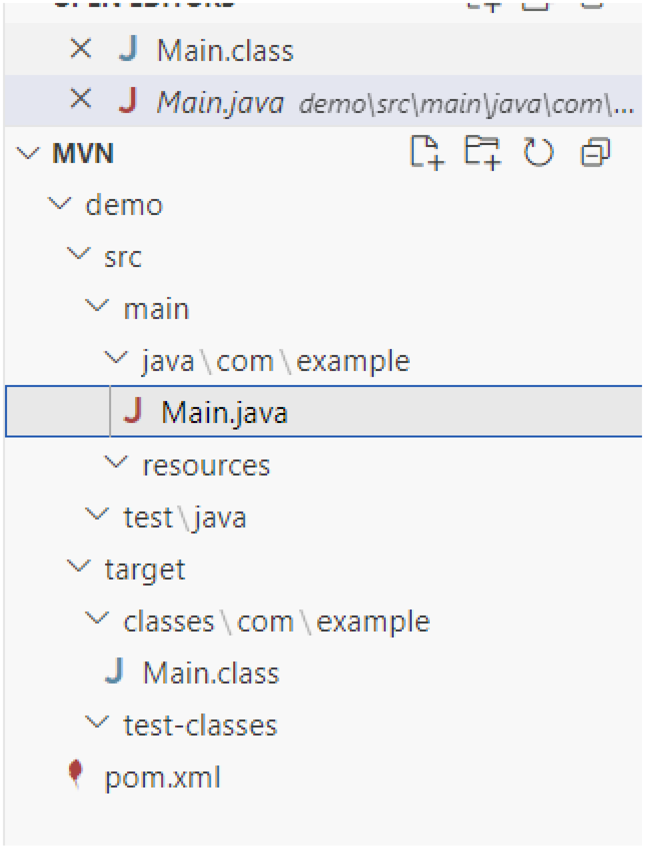
Input group Id of your project. (Press 'Enter' to confirm or 'Escape' to cancel)

demo

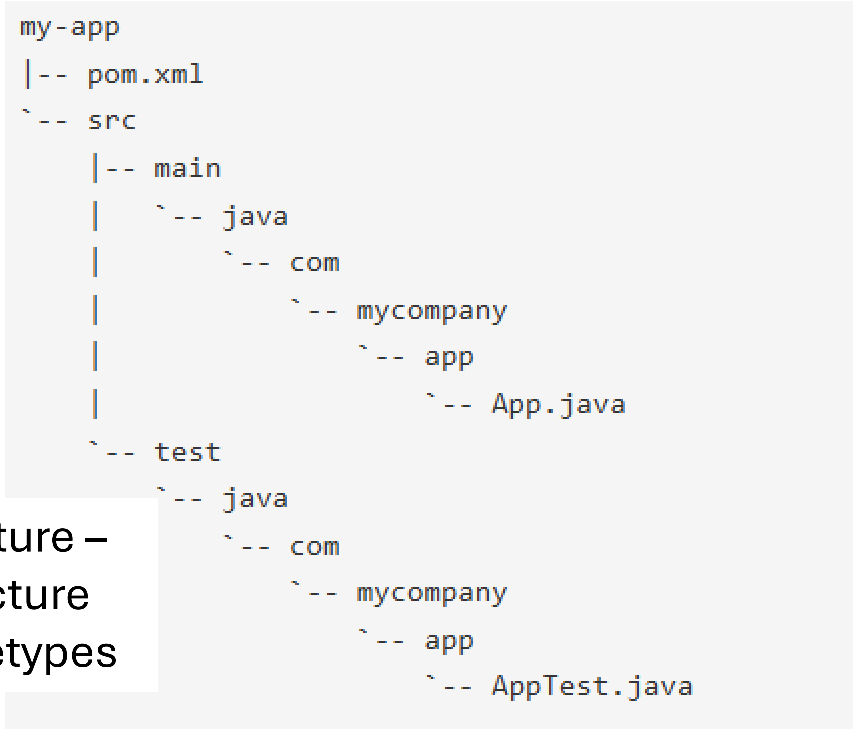
Input arti

Must select the directory

The structure



```
× Main.class
× Main.java  demo\src\main\java\com\...
MVN
  demo
    src
      main
        java \ com \ example
          Main.java
        resources
      test \ java
    target
      classes \ com \ example
        Main.class
      test-classes
    pom.xml
```

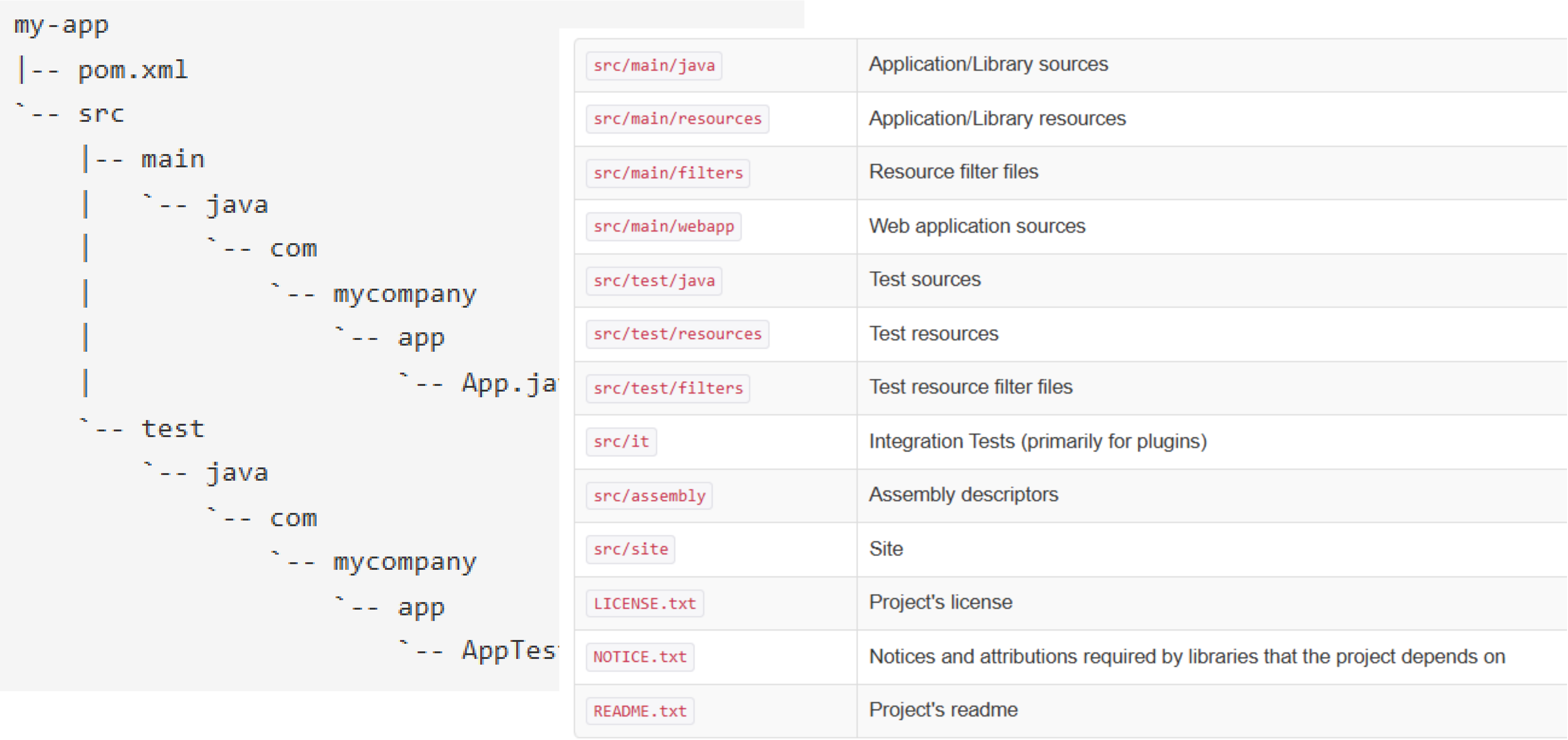


```
my-app
|-- pom.xml
`-- src
    |-- main
    |   `-- java
    |       `-- com
    |           `-- mycompany
    |               `-- app
    |                   `-- App.java
    `-- test
        `-- java
            `-- com
                `-- mycompany
                    `-- app
                        `-- AppTest.java
```

Maven creates the structure – this is the common structure of a shared by java archetypes

The structure

```
cd my-app
```



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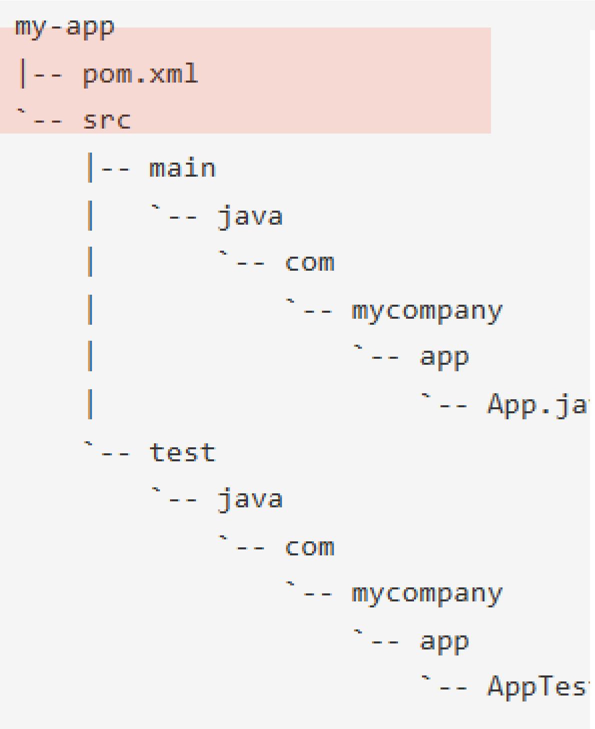
    |           `-- mycompany
    |               `-- app
    |                   `-- App.ja
    `-- test
        `-- java
            `-- com
                `-- mycompany
                    `-- app
                        `-- AppTes
```

`src/main/java`	Application/Library sources
`src/main/resources`	Application/Library resources
`src/main/filters`	Resource filter files
`src/main/webapp`	Web application sources
`src/test/java`	Test sources
`src/test/resources`	Test resources
`src/test/filters`	Test resource filter files
`src/it`	Integration Tests (primarily for plugins)
`src/assembly`	Assembly descriptors
`src/site`	Site
`LICENSE.txt`	Project's license
`NOTICE.txt`	Notices and attributions required by libraries that the project depends on
`README.txt`	Project's readme

https://maven.apache.org/guides/introduction/introduction-to-the-standard-directory-layout.html

The structure

```
cd my-app
```



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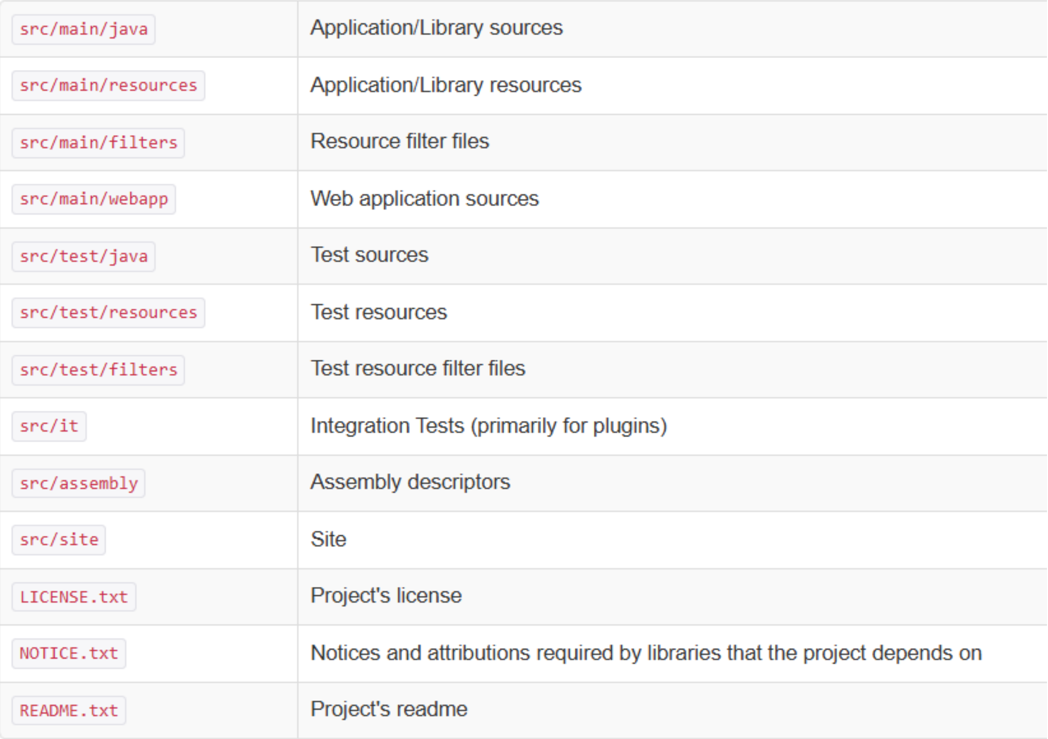

`src/main/java`	Application/Library sources
`src/main/resources`	Application/Library resources
`src/main/filters`	Resource filter files
`src/main/webapp`	Web application sources
`src/test/java`	Test sources
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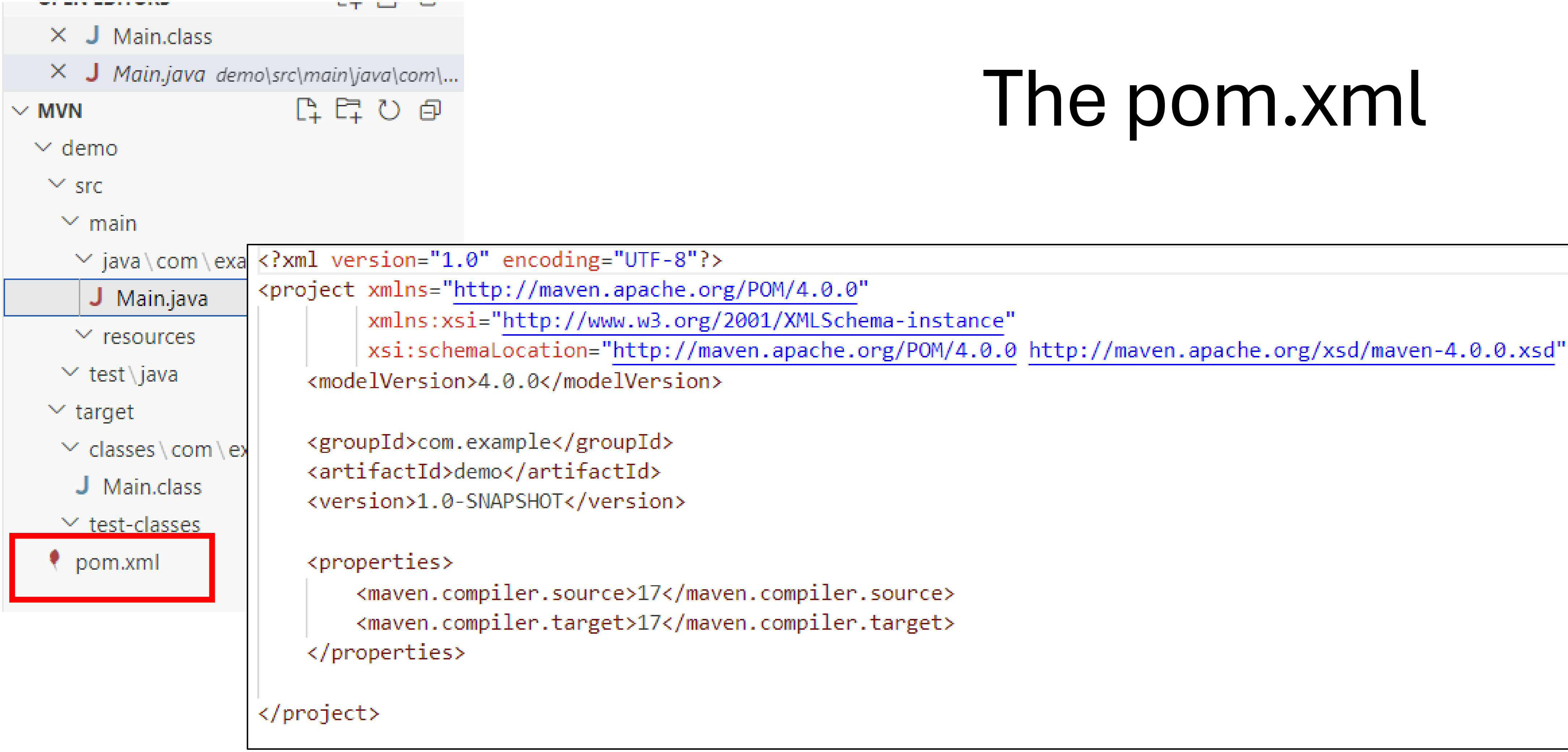
pom. xml (Project Object Model)

- **Fundamental** file in Maven
- Xml file
- Contains:
  - configuration,
  - dependencies, and
  - project information required for building a Java project.
- details about
  - the project and
  - dependencies (libraries or frameworks),
  - plugins,
  - goals,
  - and build lifecycle.

The pom.xml



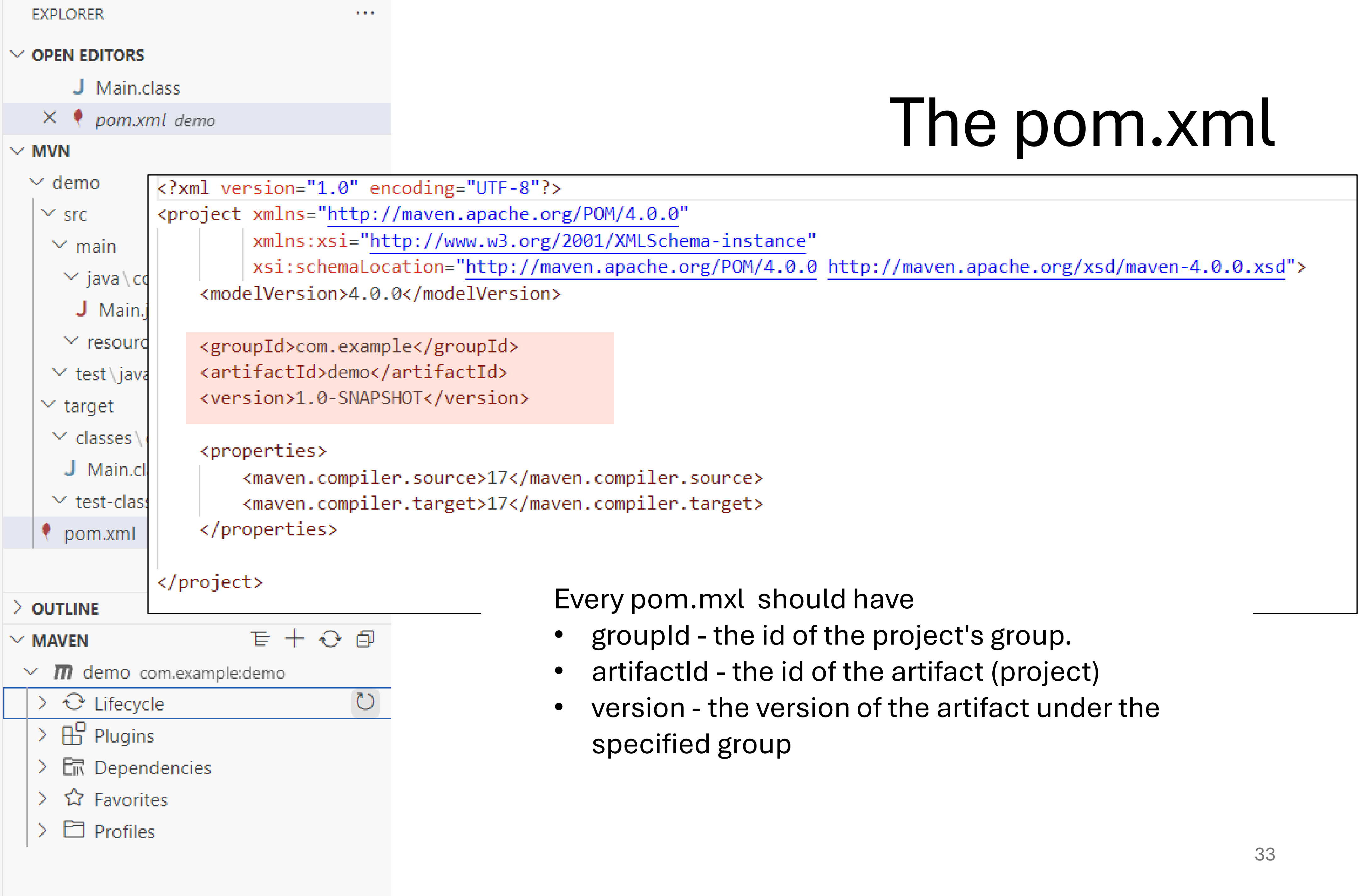
```xml
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd"
    <modelVersion>4.0.0</modelVersion>

    <groupId>com.example</groupId>
    <artifactId>demo</artifactId>
    <version>1.0-SNAPSHOT</version>

    <properties>
        <maven.compiler.source>17</maven.compiler.source>
        <maven.compiler.target>17</maven.compiler.target>
    </properties>

</project>
```

The pom.xml



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         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
    <modelVersion>4.0.0</modelVersion>

    <groupId>com.example</groupId>
    <artifactId>demo</artifactId>
    <version>1.0-SNAPSHOT</version>

    <properties>
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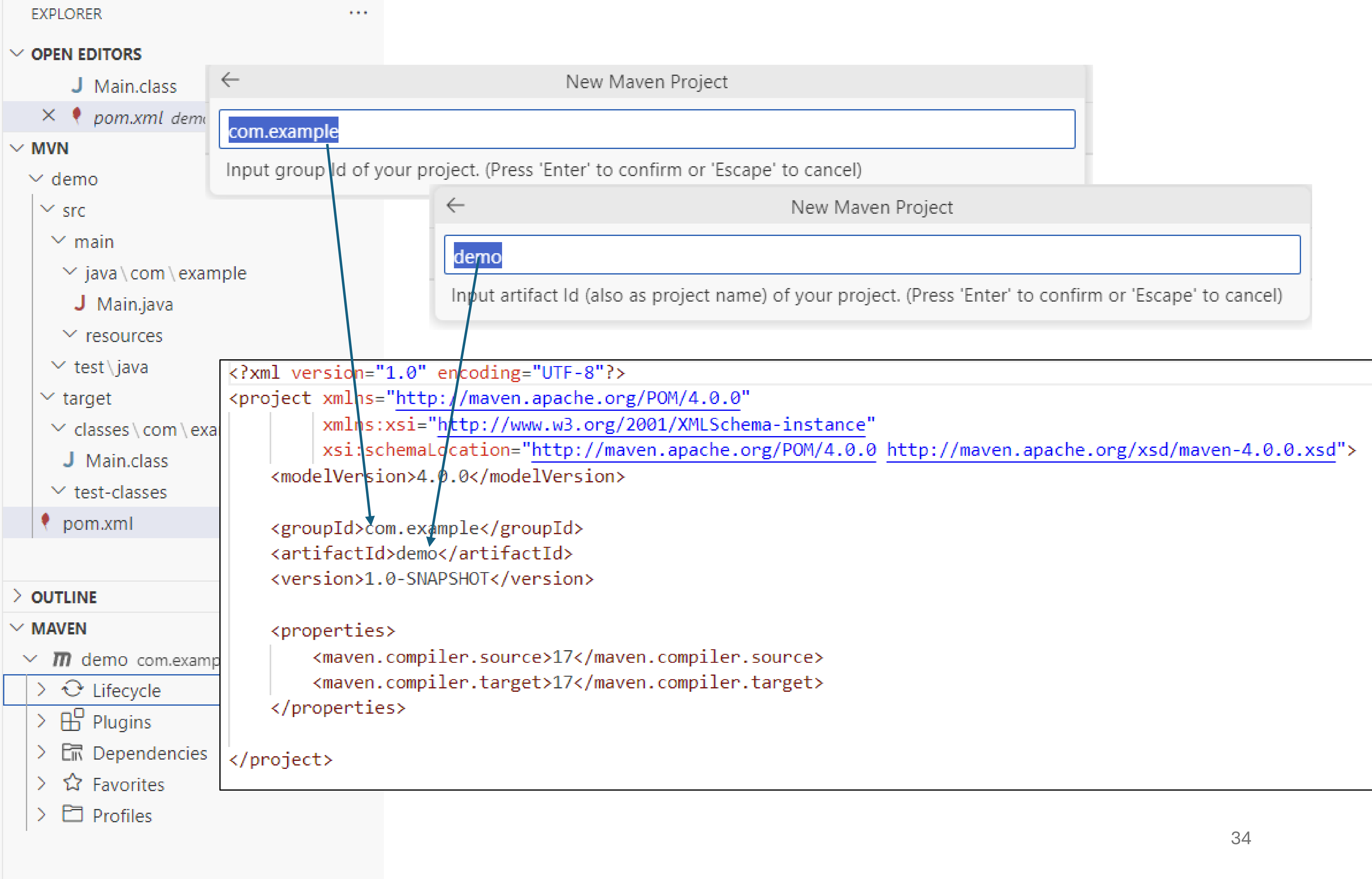
        <maven.compiler.target>17</maven.compiler.target>
    </properties>

</project>
```

Every pom.mxl should have

- groupId - the id of the project's group.
- artifactId - the id of the artifact (project)
- version - the version of the artifact under the specified group

universidade de aveiro



New Maven Project

com.example

Input group Id of your project. (Press 'Enter' to confirm or 'Escape' to cancel)

New Maven Project

demo

Input artifact Id (also as project name) of your project. (Press 'Enter' to confirm or 'Escape' to cancel)

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         xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
    <modelVersion>4.0.0</modelVersion>

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    <version>1.0-SNAPSHOT</version>

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    </properties>

</project>
```
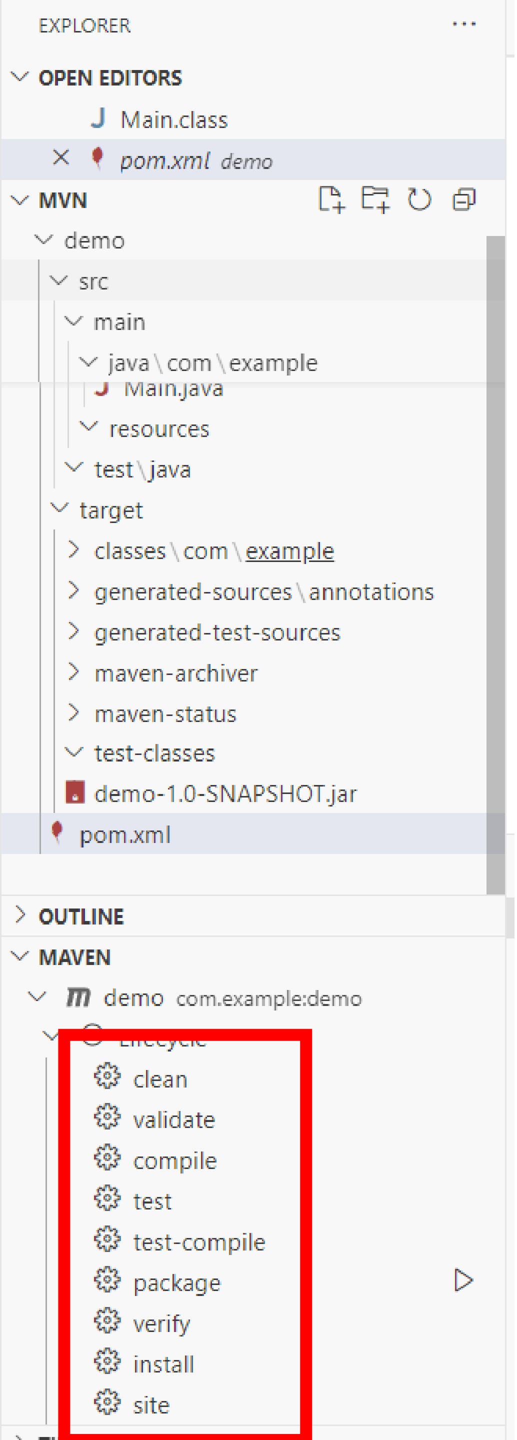
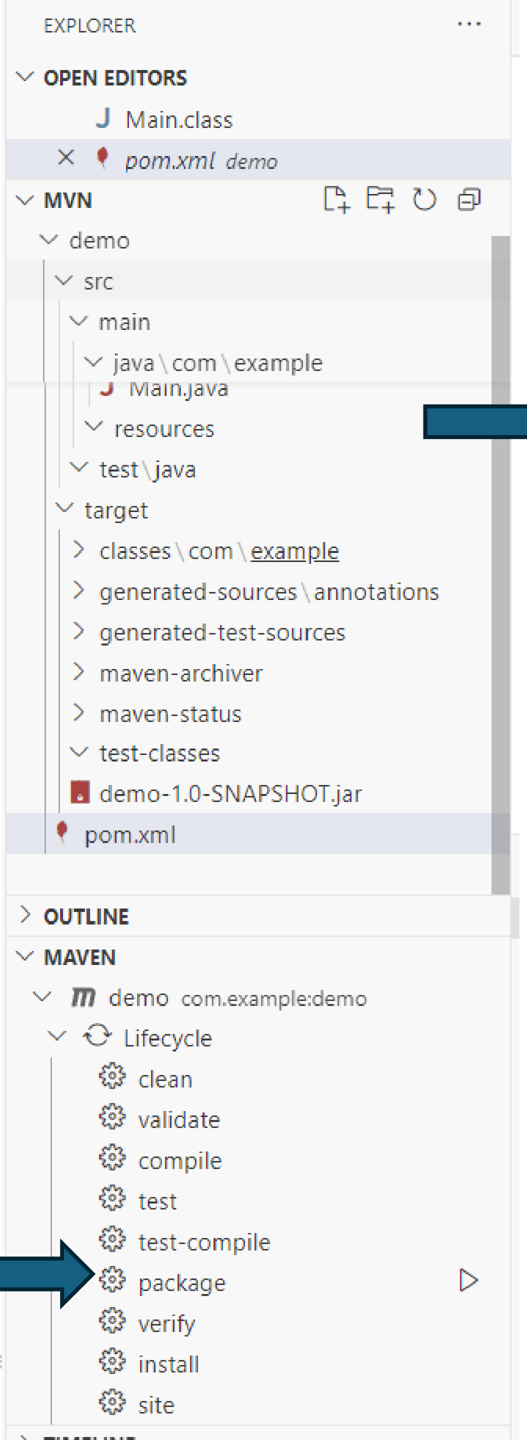
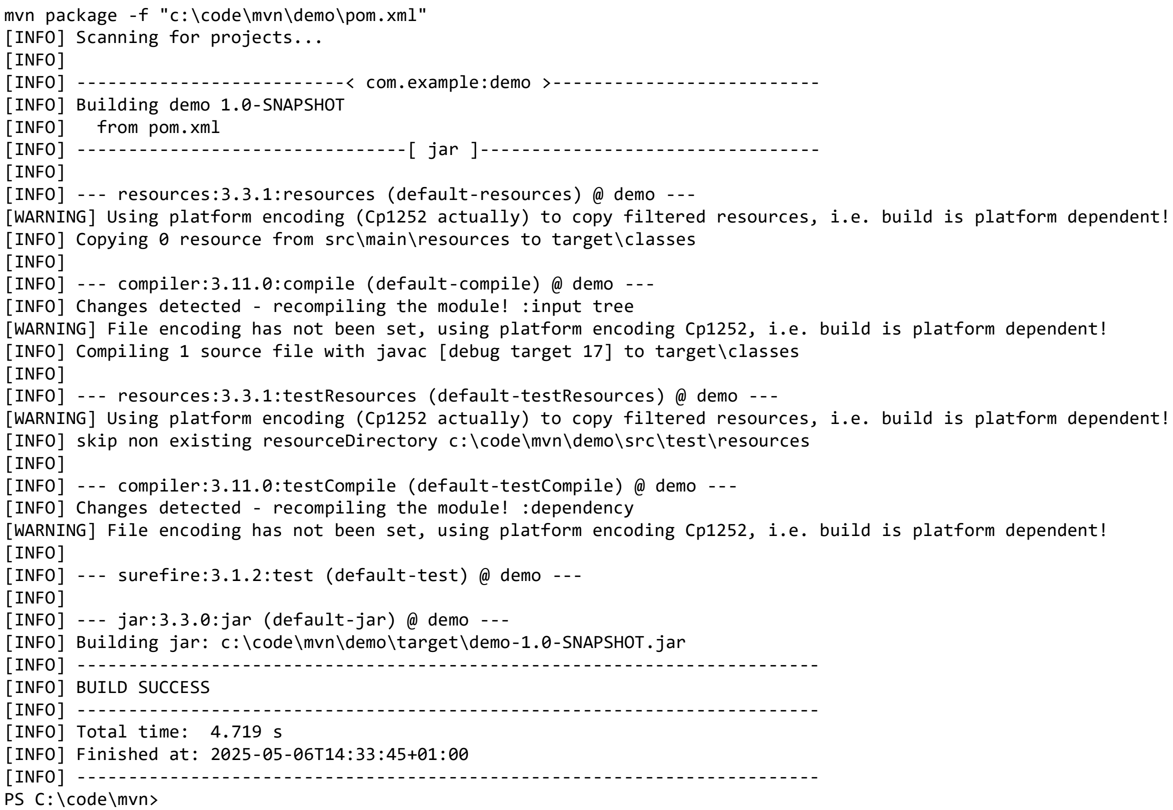

lifecycle



- clean – deletes the target folder.
- compile – turns source files into class files.
- test – runs a project’s unit tests.
- package – creates an artifact such as a JAR, ZIP or WAR file.
- install – moves a created artifact into a Maven repository.
- And much more ...

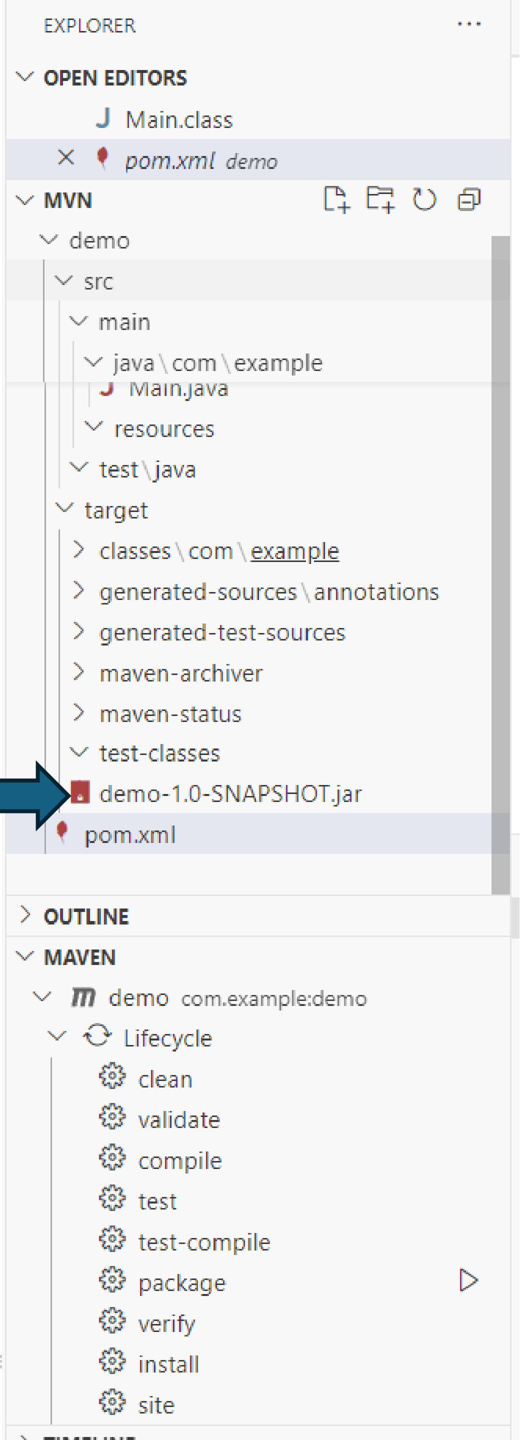
Mvn package



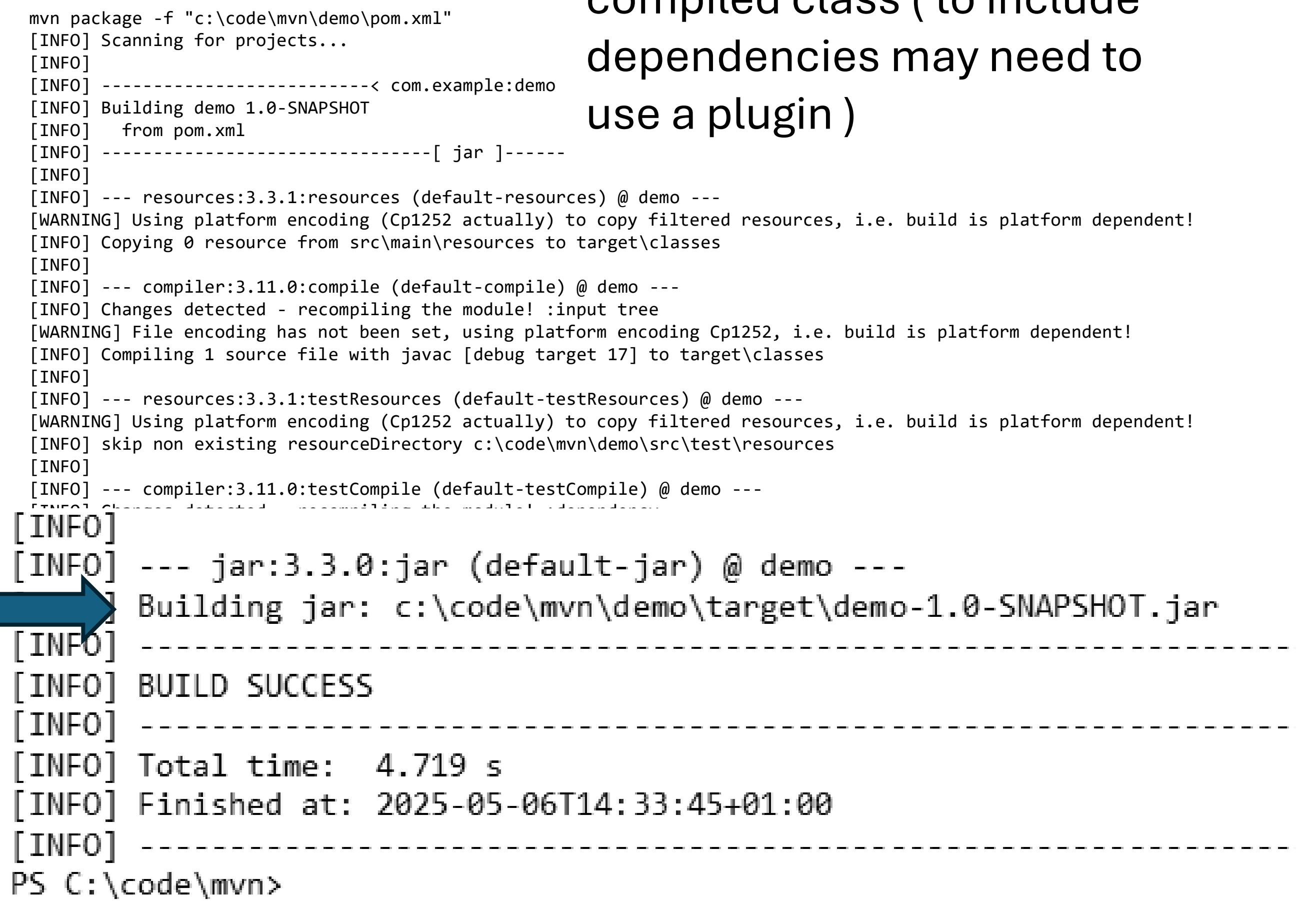


```
mvn package -f "c:\code\mvn\demo\pom.xml"
[INFO] Scanning for projects...
[INFO]
[INFO] --------------------------< com.example:demo >--------------------------
[INFO] Building demo 1.0-SNAPSHOT
[INFO]   from pom.xml
[INFO] --------------------------------[ jar ]---------------------------------
[INFO]
[INFO] --- resources:3.3.1:resources (default-resources) @ demo ---
[WARNING] Using platform encoding (Cp1252 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] Copying 0 resource from src\main\resources to target\classes
[INFO]
[INFO] --- compiler:3.11.0:compile (default-compile) @ demo ---
[INFO] Changes detected - recompiling the module! :input tree
[WARNING] File encoding has not been set, using platform encoding Cp1252, i.e. build is platform dependent!
[INFO] Compiling 1 source file with javac [debug target 17] to target\classes
[INFO]
[INFO] --- resources:3.3.1:testResources (default-testResources) @ demo ---
[WARNING] Using platform encoding (Cp1252 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory c:\code\mvn\demo\src\test\resources
[INFO]
[INFO] --- compiler:3.11.0:testCompile (default-testCompile) @ demo ---
[INFO] Changes detected - recompiling the module! :dependency
[WARNING] File encoding has not been set, using platform encoding Cp1252, i.e. build is platform dependent!
[INFO]
[INFO] --- surefire:3.1.2:test (default-test) @ demo ---
[INFO]
[INFO] --- jar:3.3.0:jar (default-jar) @ demo ---
[INFO] Building jar: c:\code\mvn\demo\target\demo-1.0-SNAPSHOT.jar
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time:  4.719 s
[INFO] Finished at: 2025-05-06T14:33:45+01:00
[INFO] ------------------------------------------------------------------------
PS C:\code\mvn>
```

Mvn package



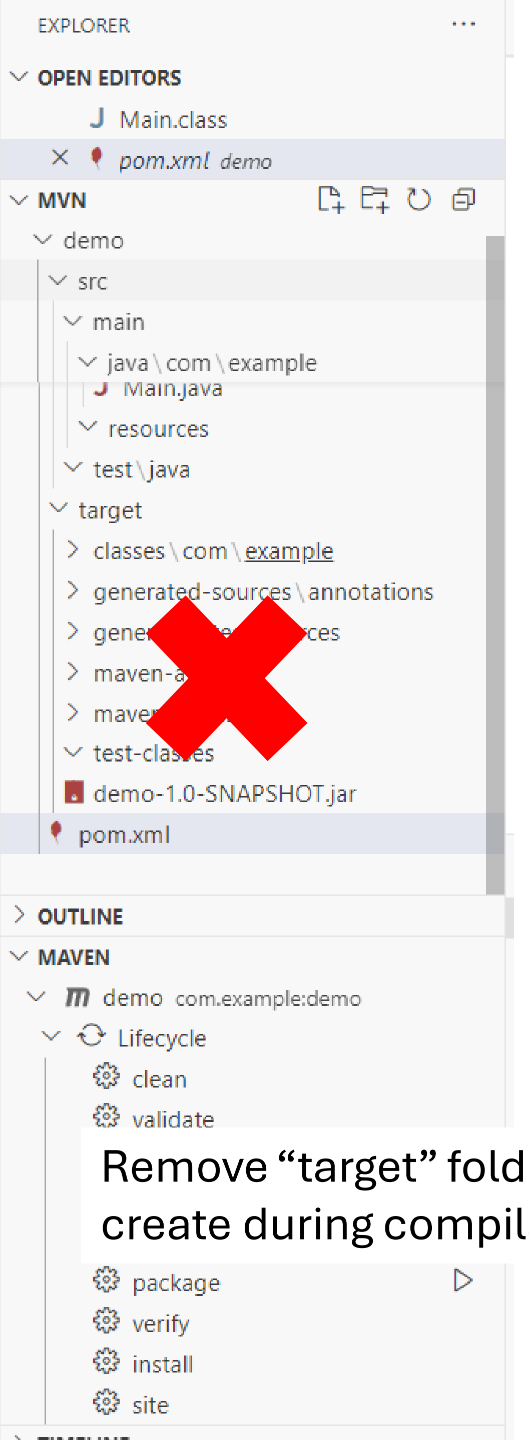
Create a jar file containing the compiled class (to include dependencies may need to use a plugin)

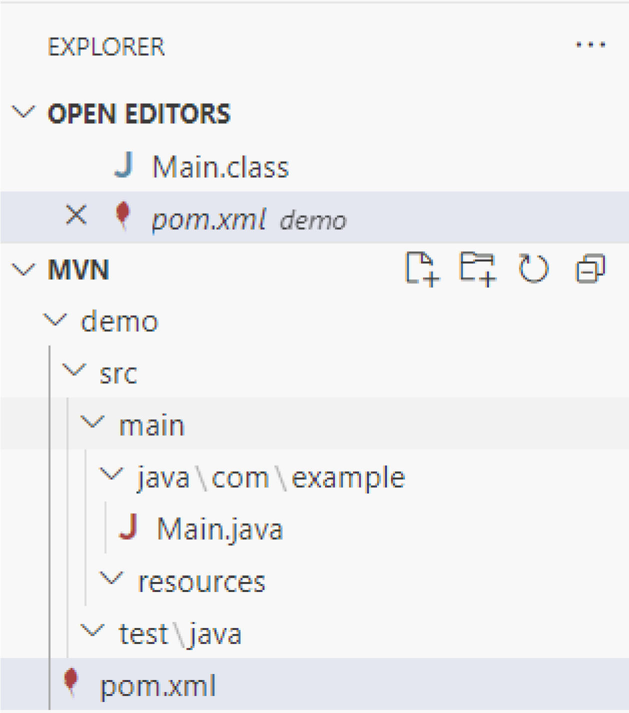


```
mvn package -f "c:\code\mvn\demo\pom.xml"
[INFO] Scanning for projects...
[INFO]
[INFO] -------------------------< com.example:demo
[INFO] Building demo 1.0-SNAPSHOT
[INFO]   from pom.xml
[INFO] --------------------------------[ jar ]------
[INFO]
[INFO] --- resources:3.3.1:resources (default-resources) @ demo ---
[WARNING] Using platform encoding (Cp1252 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] Copying 0 resource from src\main\resources to target\classes
[INFO]
[INFO] --- compiler:3.11.0:compile (default-compile) @ demo ---
[INFO] Changes detected - recompiling the module! :input tree
[WARNING] File encoding has not been set, using platform encoding Cp1252, i.e. build is platform dependent!
[INFO] Compiling 1 source file with javac [debug target 17] to target\classes
[INFO]
[INFO] --- resources:3.3.1:testResources (default-testResources) @ demo ---
[WARNING] Using platform encoding (Cp1252 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory c:\code\mvn\demo\src\test\resources
[INFO]
[INFO] --- compiler:3.11.0:testCompile (default-testCompile) @ demo ---
```

```
[INFO]
[INFO] --- jar:3.3.0:jar (default-jar) @ demo ---
      ] Building jar: c:\code\mvn\demo\target\demo-1.0-SNAPSHOT.jar
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time:  4.719 s
[INFO] Finished at: 2025-05-06T14:33:45+01:00
[INFO] ------------------------------------------------------------------------
PS C:\code\mvn>
```

Mvn clean



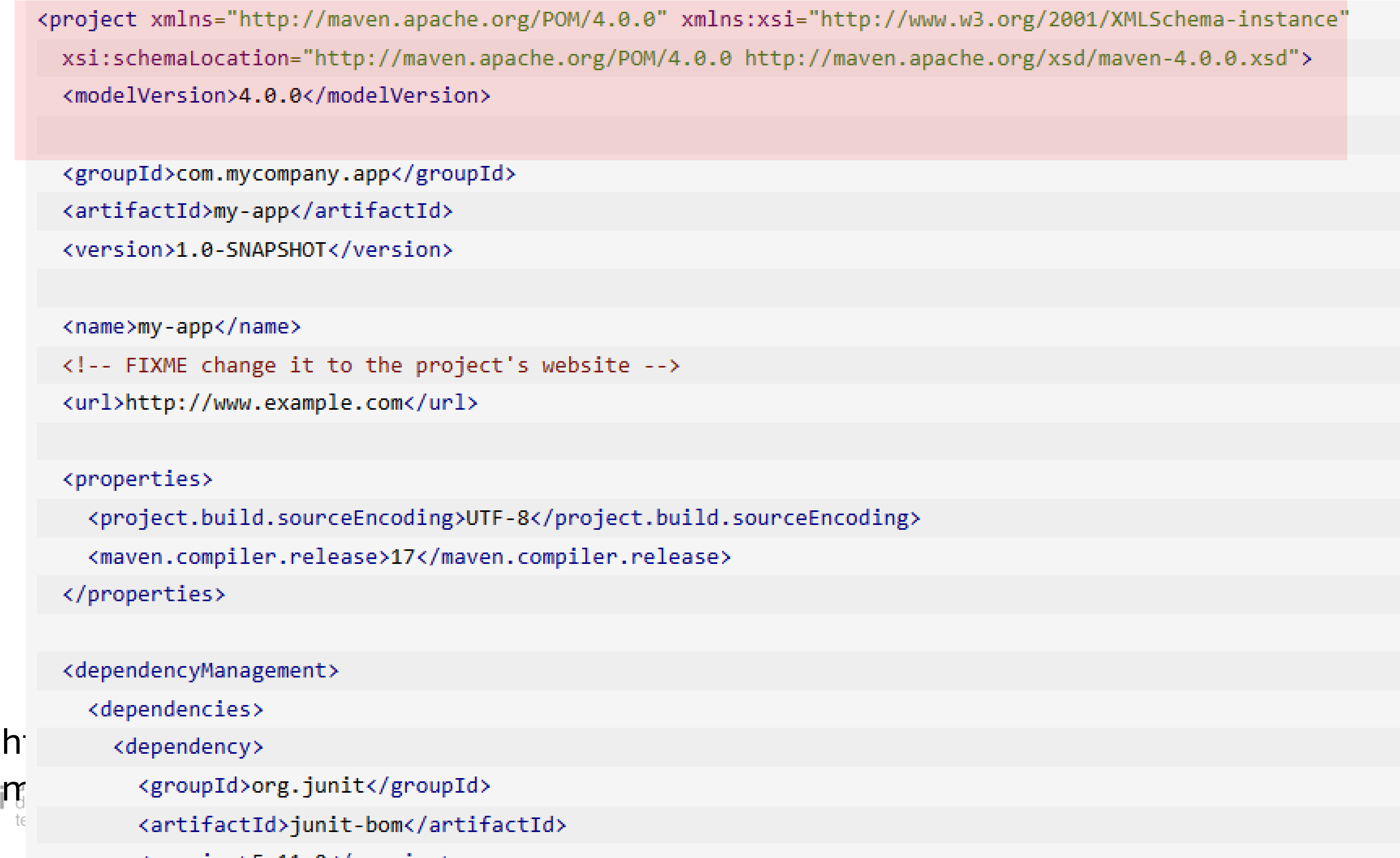


Remove “target” folder i.e. remove all files create during compilatiion and deployment

```
PS C:\code\mvn> & mvn clean -f "c:\code\mvn\demo\pom.xml"
[INFO] Scanning for projects...
[INFO]
[INFO] --------------------------< com.example:demo >--------------------------
[INFO] Building demo 1.0-SNAPSHOT
[INFO]   from pom.xml
[INFO] --------------------------------[ jar ]---------------------------------
[INFO]
[INFO] --- clean:3.2.0:clean (default-clean) @ demo ---
[INFO] Deleting c:\code\mvn\demo\target
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time:  0.384 s
[INFO] Finished at: 2025-05-06T14:40:02+01:00
[INFO] ------------------------------------------------------------------------
PS C:\code\mvn>
```

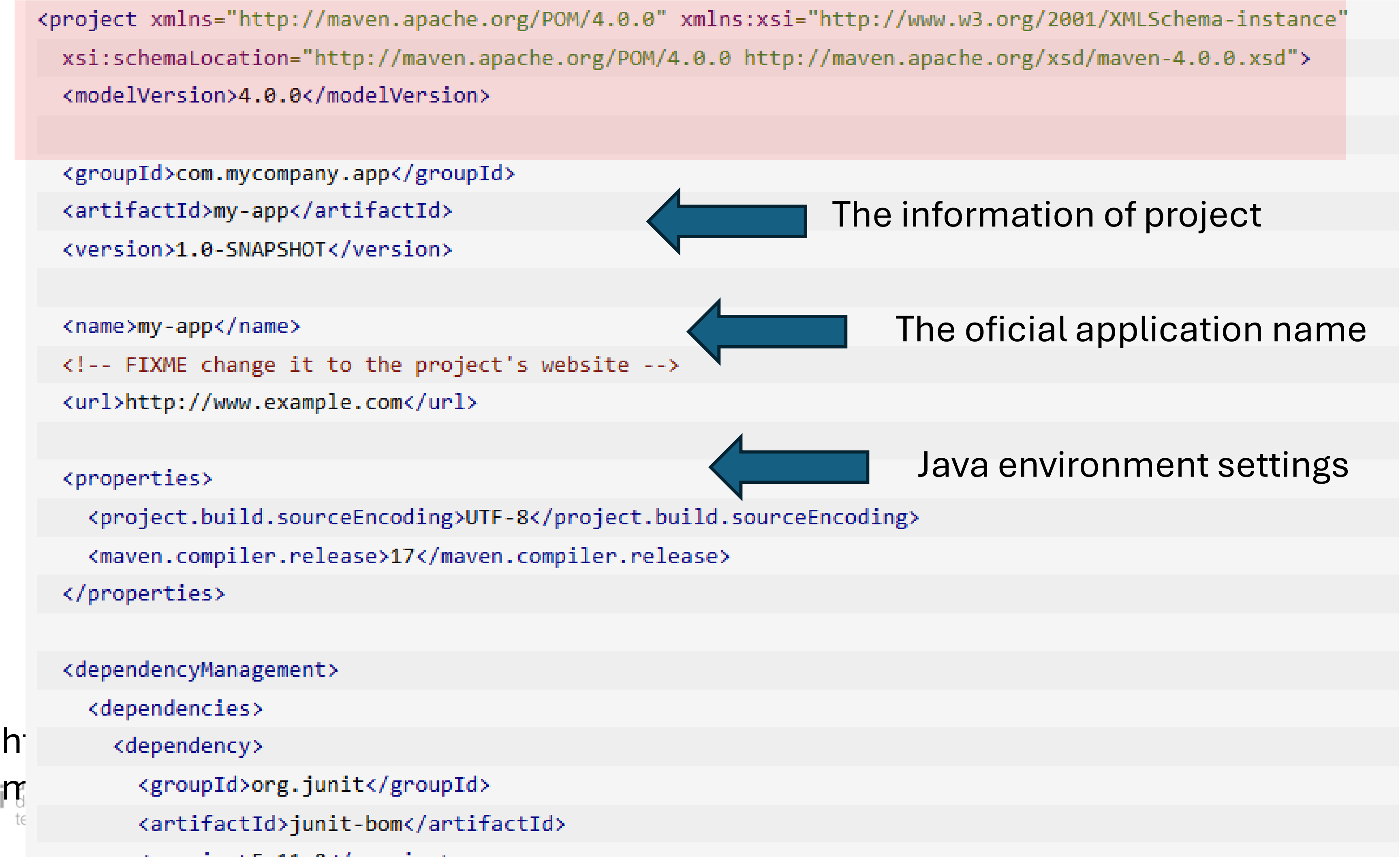
Some details on Pom.xml

The pom.xml



```
<project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
  <modelVersion>4.0.0</modelVersion>

  <groupId>com.mycompany.app</groupId>
  <artifactId>my-app</artifactId>
  <version>1.0-SNAPSHOT</version>

  <name>my-app</name>
  <!-- FIXME change it to the project's website -->
  <url>http://www.example.com</url>

  <properties>
    <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
    <maven.compiler.release>17</maven.compiler.release>
  </properties>

  <dependencyManagement>
    <dependencies>
      <dependency>
        <groupId>org.junit</groupId>
        <artifactId>junit-bom</artifactId>
```

The pom.xml



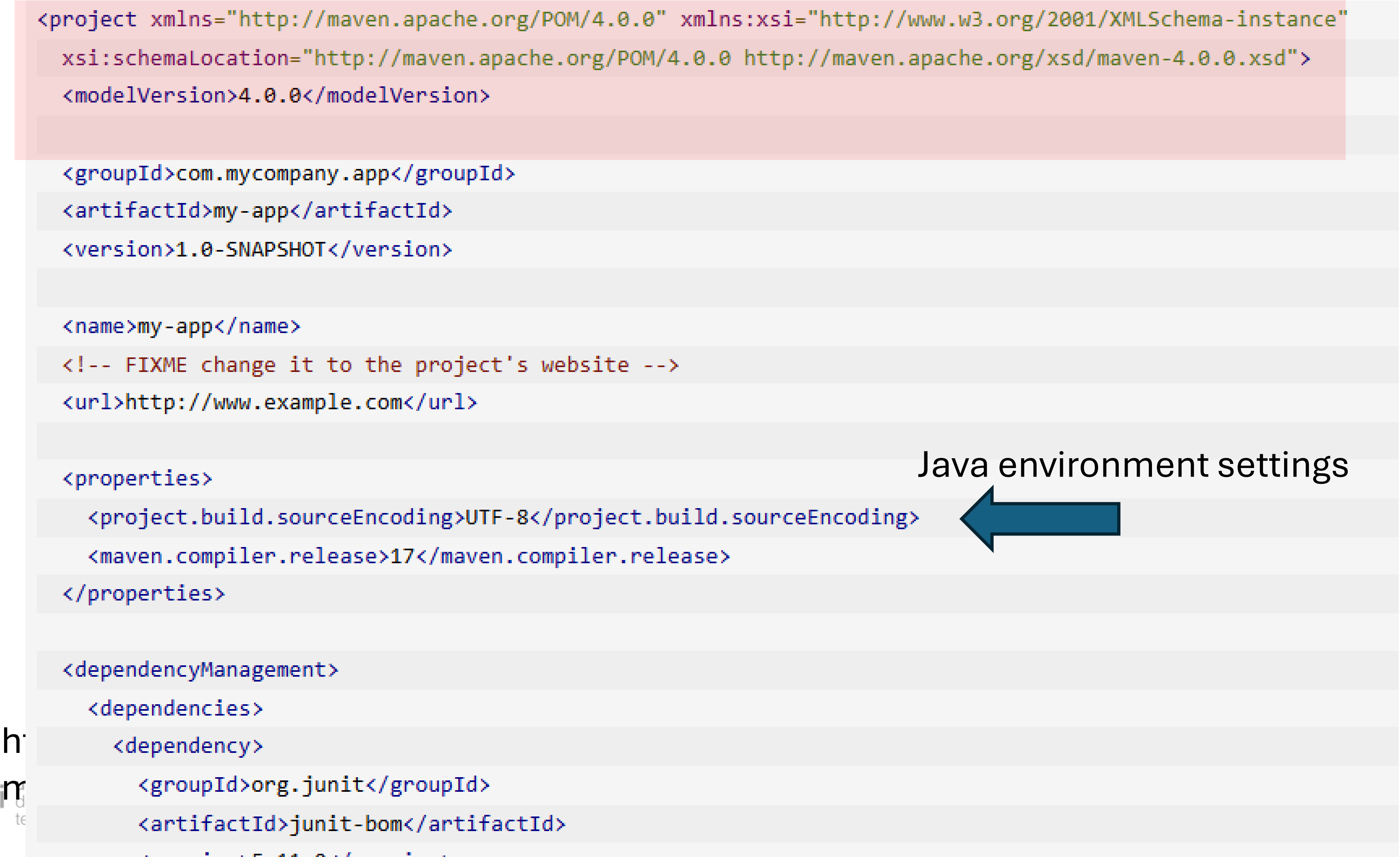
```xml
<project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
  <modelVersion>4.0.0</modelVersion>

  <groupId>com.mycompany.app</groupId>
  <artifactId>my-app</artifactId>
  <version>1.0-SNAPSHOT</version>

  <name>my-app</name>
  <!-- FIXME change it to the project's website -->
  <url>http://www.example.com</url>

  <properties>
    <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
    <maven.compiler.release>17</maven.compiler.release>
  </properties>

  <dependencyManagement>
    <dependencies>
      <dependency>
        <groupId>org.junit</groupId>
        <artifactId>junit-bom</artifactId>
```

The information of project

The oficial application name

Java environment settings

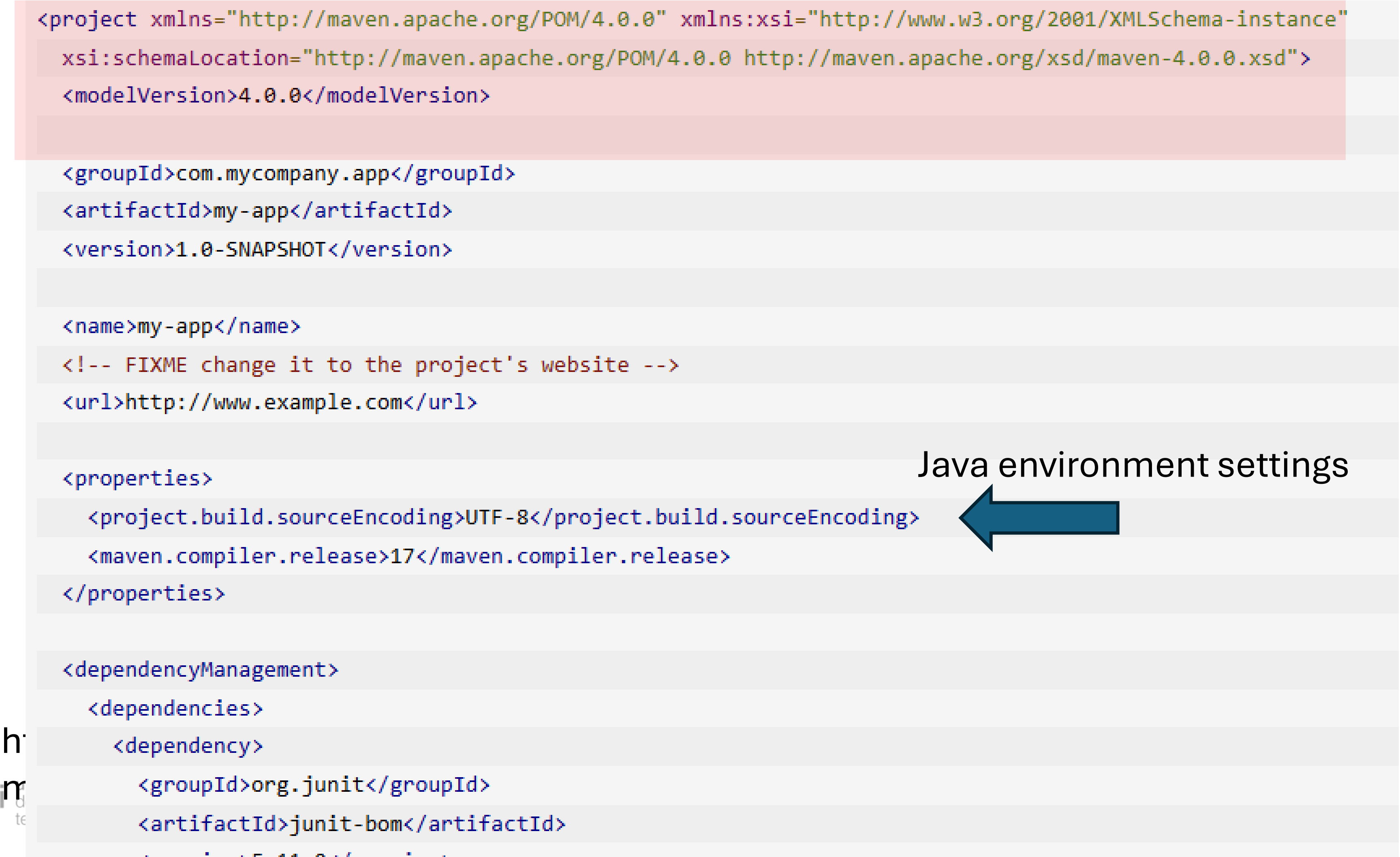
The pom.xml: the environment



```
<project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
  <modelVersion>4.0.0</modelVersion>

  <groupId>com.mycompany.app</groupId>
  <artifactId>my-app</artifactId>
  <version>1.0-SNAPSHOT</version>

  <name>my-app</name>
  <!-- FIXME change it to the project's website -->
  <url>http://www.example.com</url>

  <properties>
    <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
    <maven.compiler.release>17</maven.compiler.release>
  </properties>

  <dependencyManagement>
    <dependencies>
      <dependency>
        <groupId>org.junit</groupId>
        <artifactId>junit-bom</artifactId>
```

Java environment settings

The pom.xml: the environment



```
<project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
  <modelVersion>4.0.0</modelVersion>

  <groupId>com.mycompany.app</groupId>
  <artifactId>my-app</artifactId>
  <version>1.0-SNAPSHOT</version>

  <name>my-app</name>
  <!-- FIXME change it to the project's website -->
  <url>http://www.example.com</url>

  <properties>
    <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
    <maven.compiler.release>17</maven.compiler.release>
  </properties>

  <dependencyManagement>
    <dependencies>
      <dependency>
        <groupId>org.junit</groupId>
        <artifactId>junit-bom</artifactId>
```

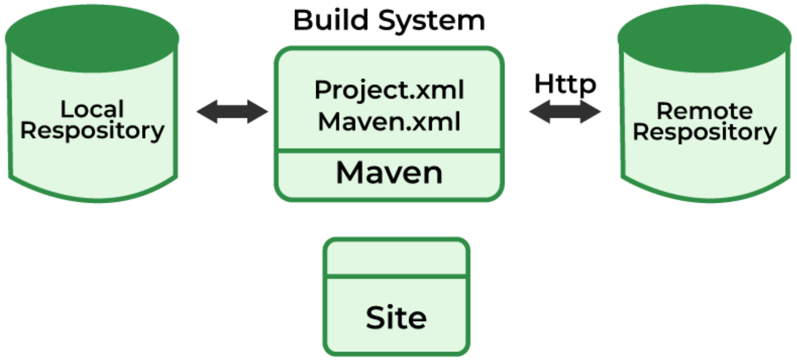
Java environment settings

h

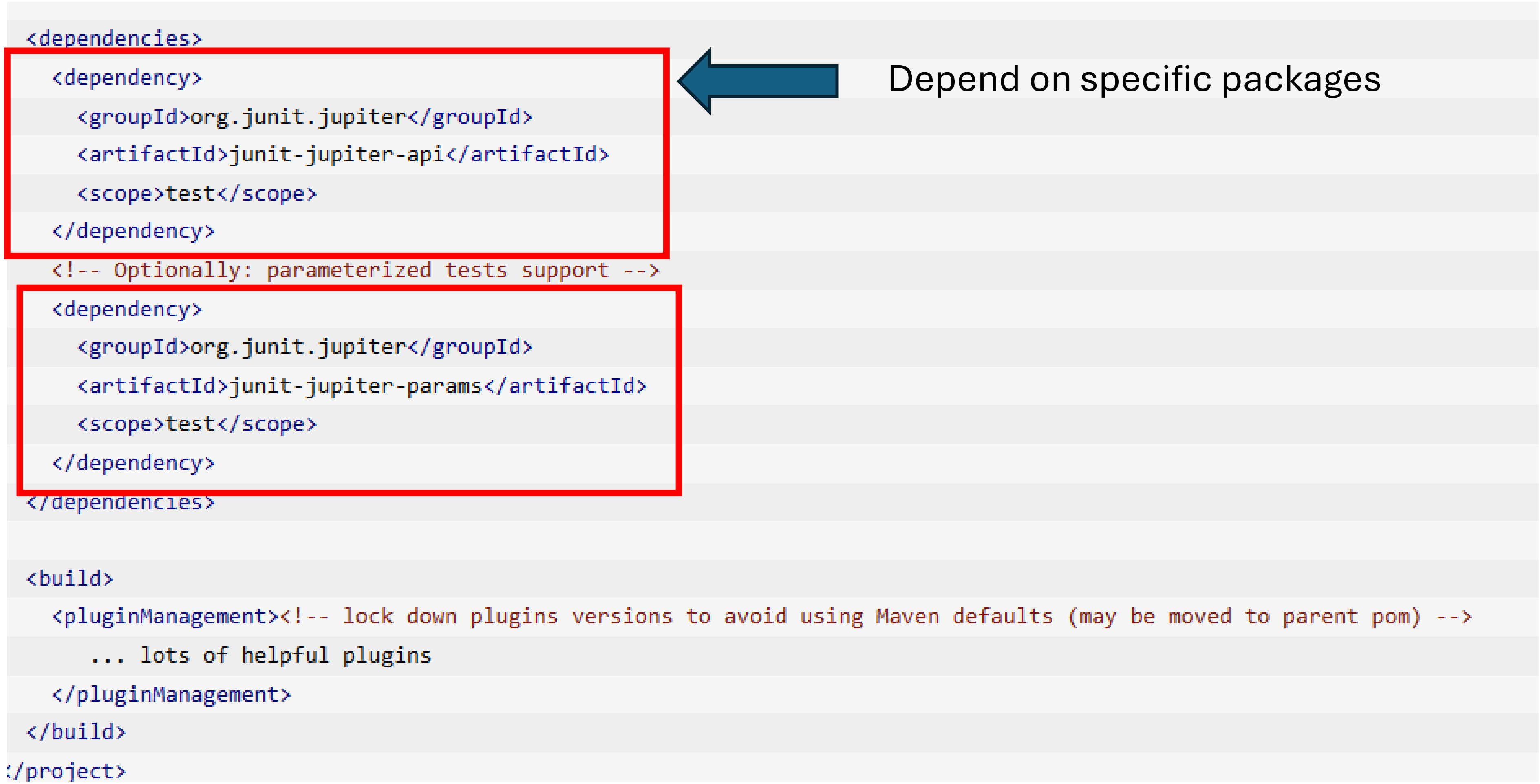
m

Maven and Dependencies repositories

- Repositories = Directories of packaged JAR files.
- local repository
    - directory on your machine’s hard drive.
- Maven looks for dependencies
    - First in local Maven repository
    - Then from a central Maven repository and puts them in your local repository.



The pom.xml: dependencies

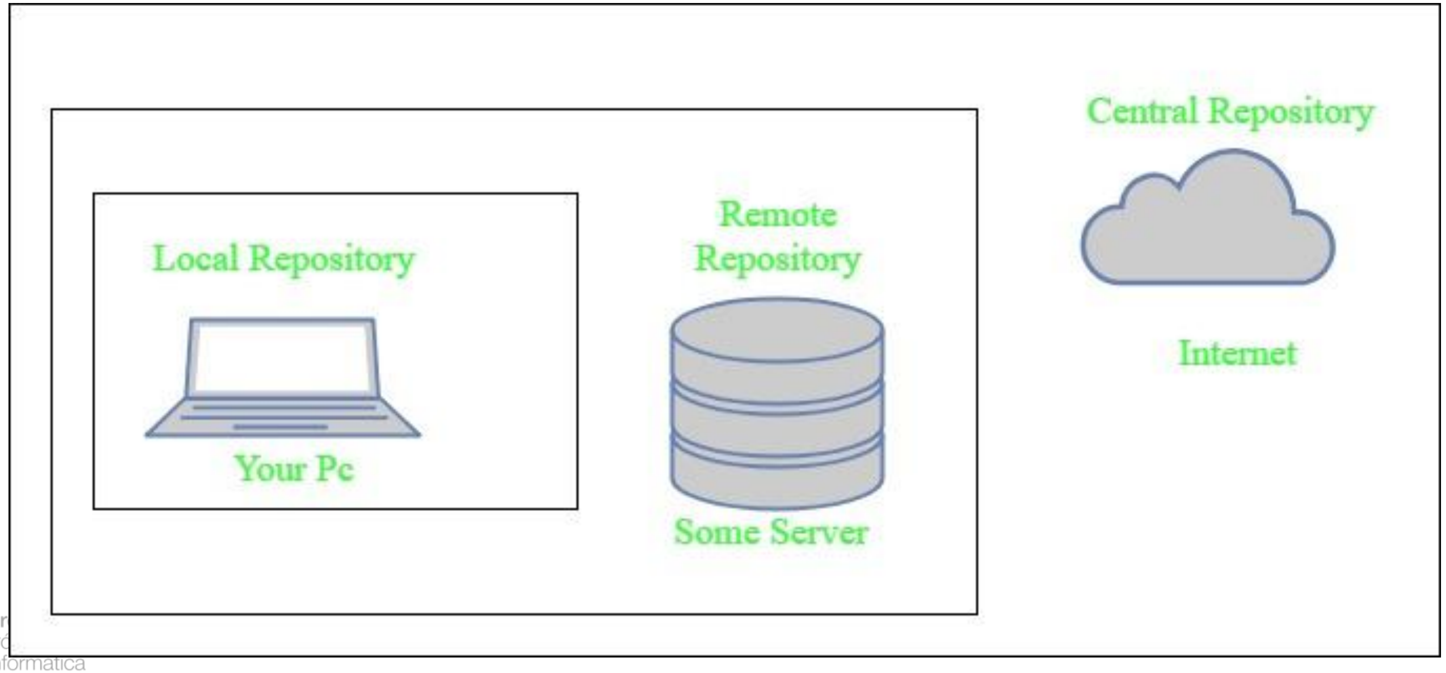


```
  <dependencies>
    <dependency>
      <groupId>org.junit.jupiter</groupId>
      <artifactId>junit-jupiter-api</artifactId>
      <scope>test</scope>
    </dependency>
    <!-- Optionally: parameterized tests support -->
    <dependency>
      <groupId>org.junit.jupiter</groupId>
      <artifactId>junit-jupiter-params</artifactId>
      <scope>test</scope>
    </dependency>
  </dependencies>

  <build>
    <pluginManagement><!-- lock down plugins versions to avoid using Maven defaults (may be moved to parent pom) -->
       ... lots of helpful plugins
    </pluginManagement>
  </build>
</project>
```

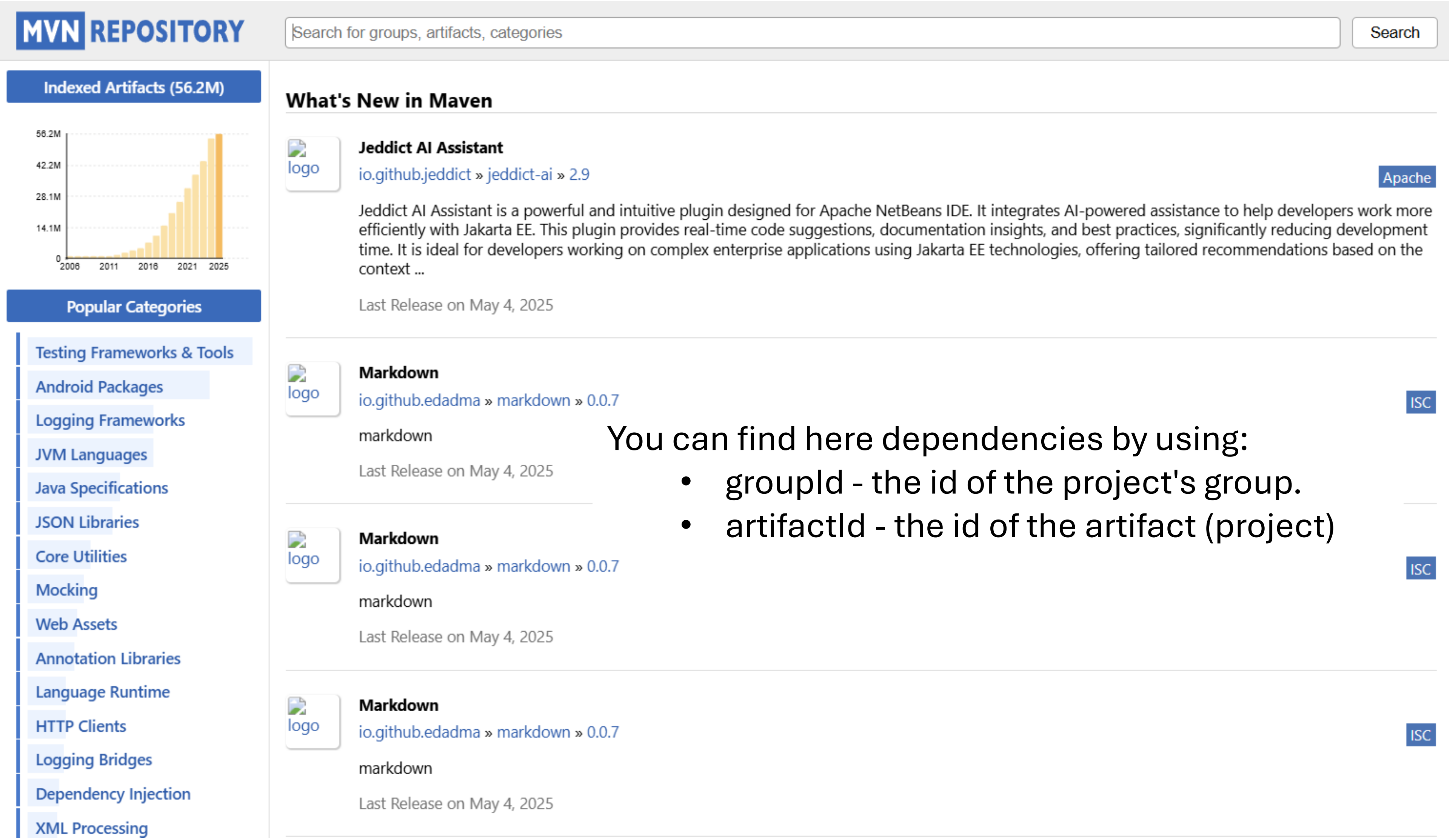
Depend on specific packages

Look for dependencies

- Locally
- Remote repositity
- Internet



https://mvnrepository.com/



- Testing Frameworks & Tools
- Android Packages
- Logging Frameworks
- JVM Languages
- Java Specifications
- JSON Libraries
- Core Utilities
- Mocking
- Web Assets
- Annotation Libraries
- Language Runtime
- HTTP Clients
- Logging Bridges
- Dependency Injection
- XML Processing

What's New in Maven

Jeddict AI Assistant

io.github.jeddict » jeddict-ai » 2.9 — Apache

Jeddict AI Assistant is a powerful and intuitive plugin designed for Apache NetBeans IDE. It integrates AI-powered assistance to help developers work more efficiently with Jakarta EE. This plugin provides real-time code suggestions, documentation insights, and best practices, significantly reducing development time. It is ideal for developers working on complex enterprise applications using Jakarta EE technologies, offering tailored recommendations based on the context ...

Last Release on May 4, 2025

Markdown

io.github.edadma » markdown » 0.0.7 — ISC

markdown

Last Release on May 4, 2025

Markdown

io.github.edadma » markdown » 0.0.7 — ISC

markdown

Last Release on May 4, 2025

Markdown

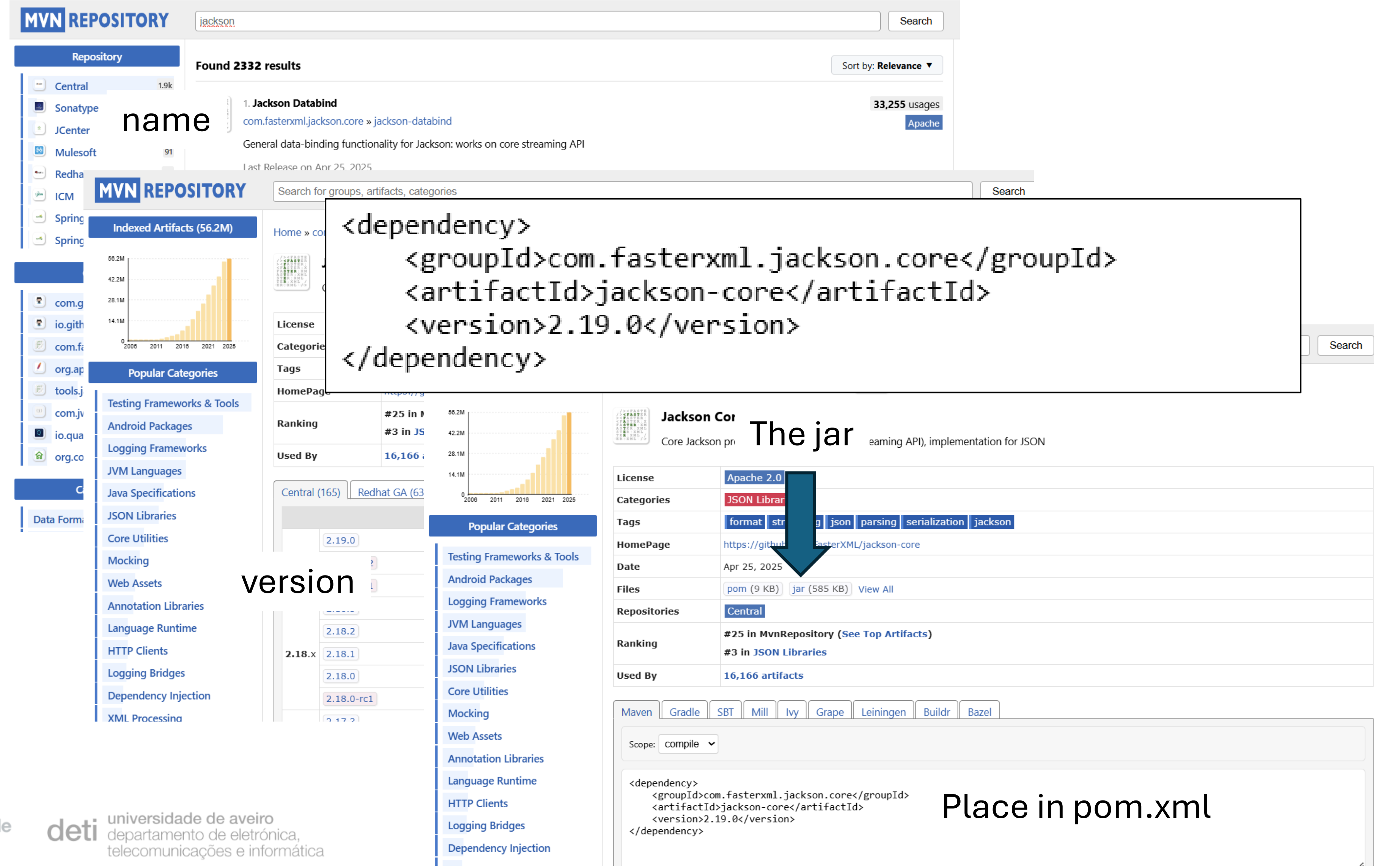
io.github.edadma » markdown » 0.0.7 — ISC

markdown

Last Release on May 4, 2025

You can find here dependencies by using:
- groupId - the id of the project's group.
- artifactId - the id of the artifact (project)

Search for dependency



jackson

Search

Repository

Central 1.9k

Sonatype

JCenter

Mulesoft 91

ICM

Found 2332 results

Sort by: Relevance ▼

1. **Jackson Databind**

com.fasterxml.jackson.core » jackson-databind

33,255 usages

Apache

General data-binding functionality for Jackson: works on core streaming API

Last Release on Apr 25, 2025

name

Search for groups, artifacts, categories

Indexed Artifacts (56.2M)

Popular Categories

Testing Frameworks & Tools
Android Packages
Logging Frameworks
JVM Languages
Java Specifications
JSON Libraries
Core Utilities
Mocking
Web Assets
Annotation Libraries
Language Runtime
HTTP Clients
Logging Bridges
Dependency Injection
XML Processing

Central (165)

2.19.0

2.18.x 2.18.2 2.18.1 2.18.0 2.18.0-rc1

version

```
<dependency>
    <groupId>com.fasterxml.jackson.core</groupId>
    <artifactId>jackson-core</artifactId>
    <version>2.19.0</version>
</dependency>
```

Jackson Cor

Core Jackson pr

The jar

eaming API), implementation for JSON

License	Apache 2.0
Categories	JSON Librar
Tags	format json parsing serialization jackson
HomePage	https://githu asterXML/jackson-core
Date	Apr 25, 2025
Files	pom (9 KB) jar (585 KB) View All
Repositories	Central
Ranking	#25 in MvnRepository (See Top Artifacts) #3 in JSON Libraries
Used By	16,166 artifacts

Maven Gradle SBT Mill Ivy Grape Leiningen Buildr Bazel

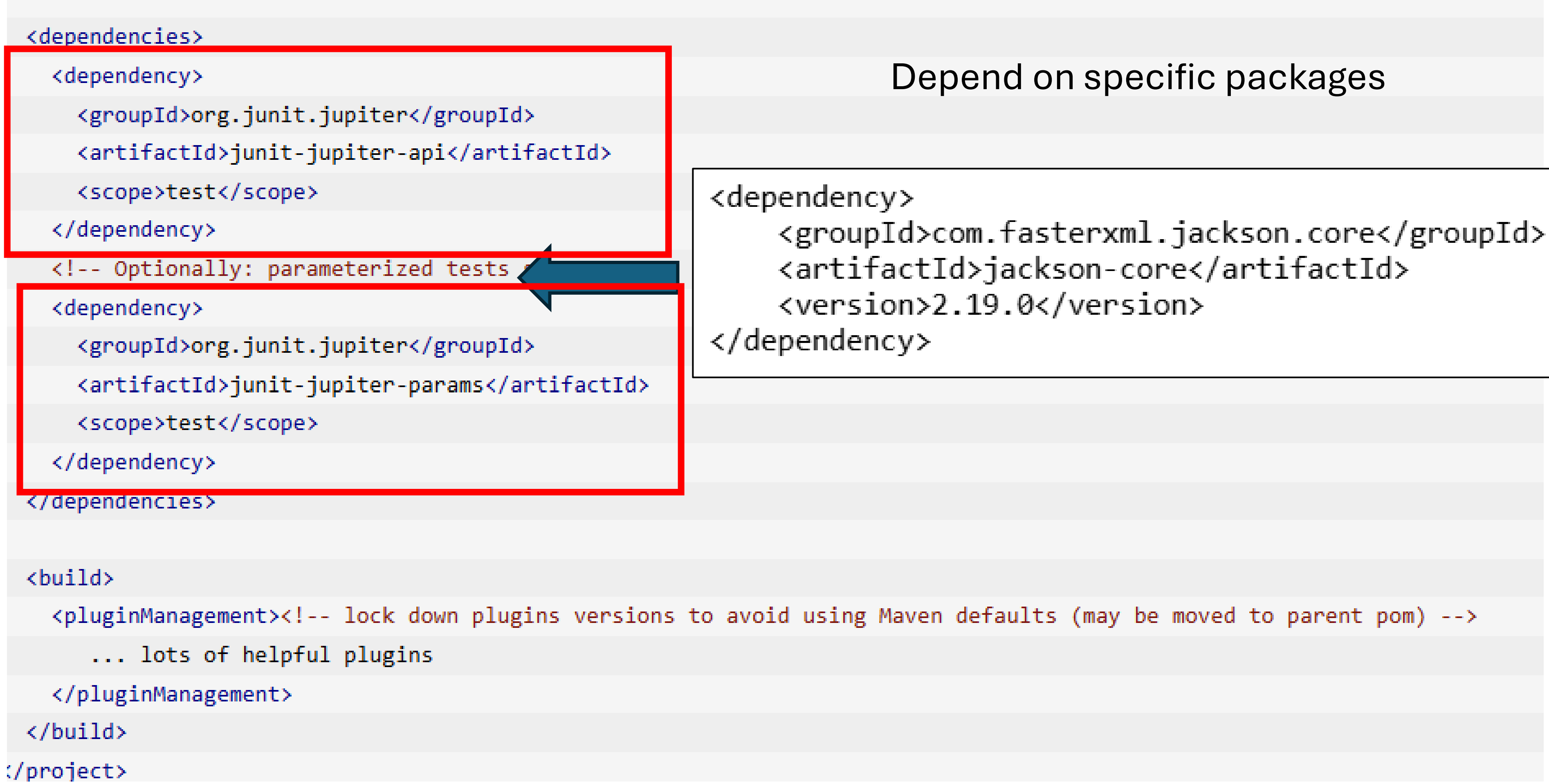
Scope: compile

```
<dependency>
    <groupId>com.fasterxml.jackson.core</groupId>
    <artifactId>jackson-core</artifactId>
    <version>2.19.0</version>
</dependency>
```

Place in pom.xml

The pom.xml: dependencies

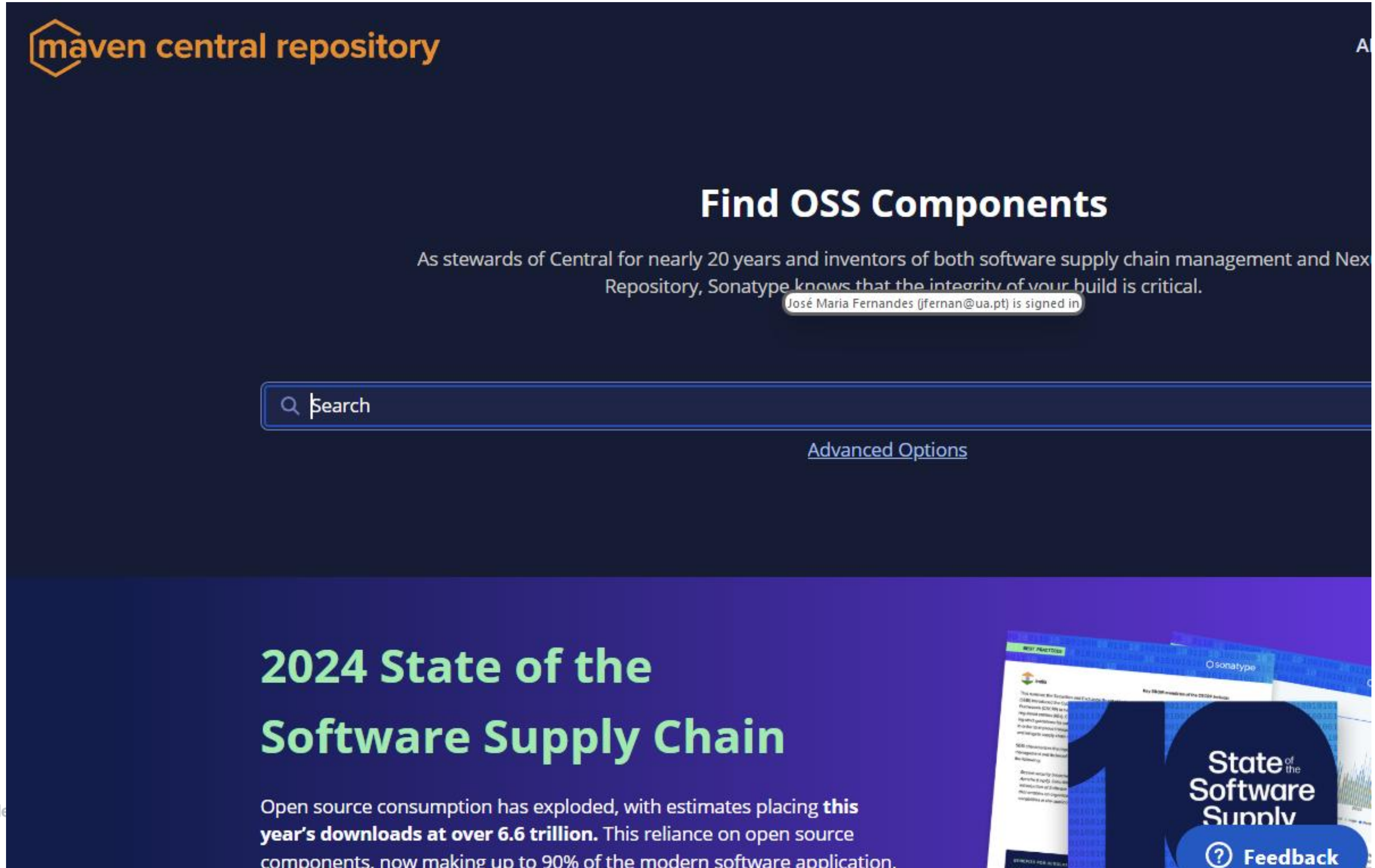
Depend on specific packages



```
<dependencies>
  <dependency>
    <groupId>org.junit.jupiter</groupId>
    <artifactId>junit-jupiter-api</artifactId>
    <scope>test</scope>
  </dependency>
  <!-- Optionally: parameterized tests
  <dependency>
    <groupId>org.junit.jupiter</groupId>
    <artifactId>junit-jupiter-params</artifactId>
    <scope>test</scope>
  </dependency>
</dependencies>

<build>
  <pluginManagement><!-- lock down plugins versions to avoid using Maven defaults (may be moved to parent pom) -->
     ... lots of helpful plugins
  </pluginManagement>
</build>
</project>
```

```
<dependency>
    <groupId>com.fasterxml.jackson.core</groupId>
    <artifactId>jackson-core</artifactId>
    <version>2.19.0</version>
</dependency>
```

https://central.sonatype.com/



Find OSS Components

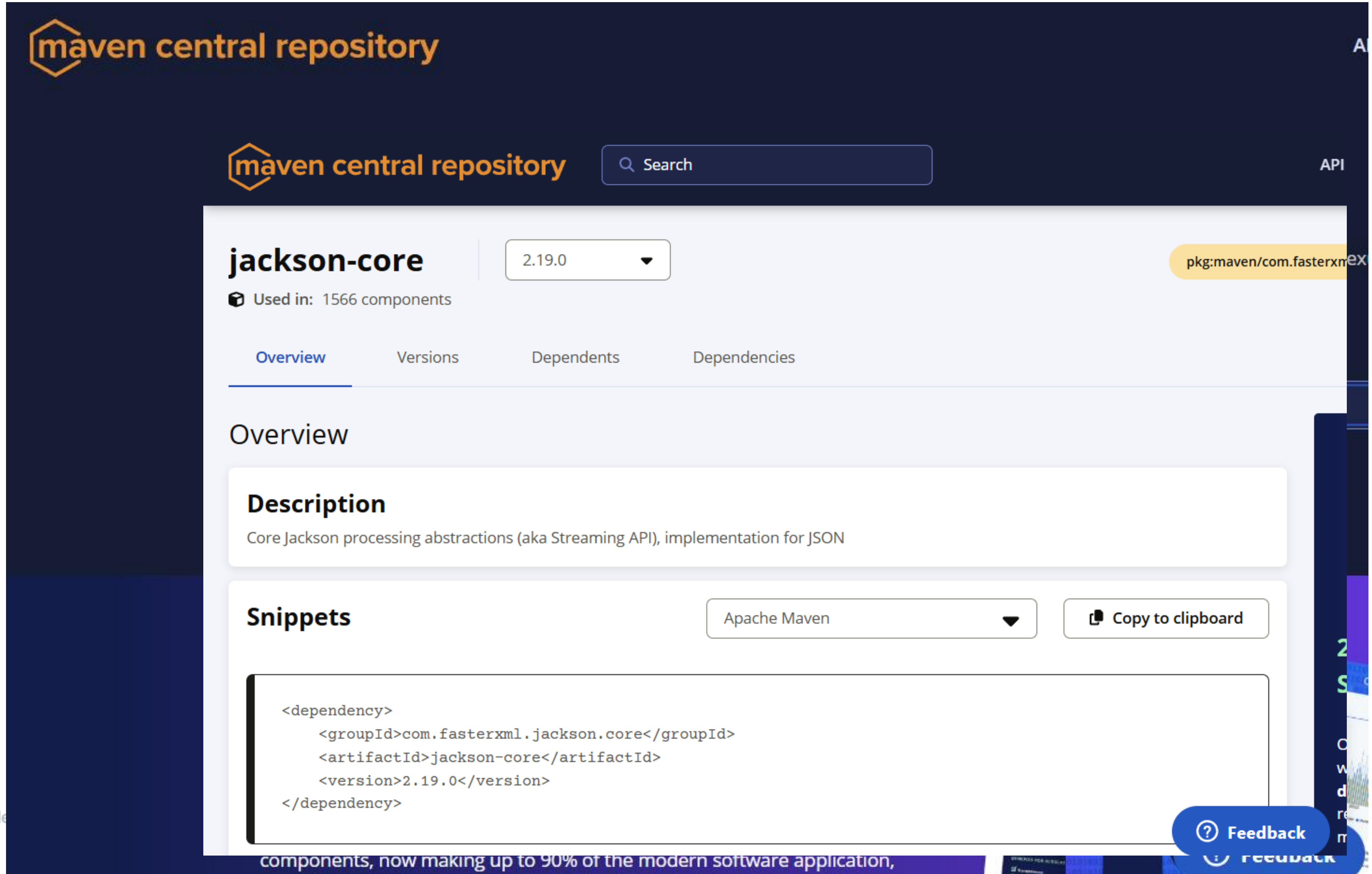
As stewards of Central for nearly 20 years and inventors of both software supply chain management and Nex
Repository, Sonatype knows that the integrity of your build is critical.

José Maria Fernandes (jfernan@ua.pt) is signed in

2024 State of the Software Supply Chain

Open source consumption has exploded, with estimates placing **this year's downloads at over 6.6 trillion.** This reliance on open source components, now making up to 90% of the modern software application,

https://central.sonatype.com/



jackson-core 2.19.0

Used in: 1566 components

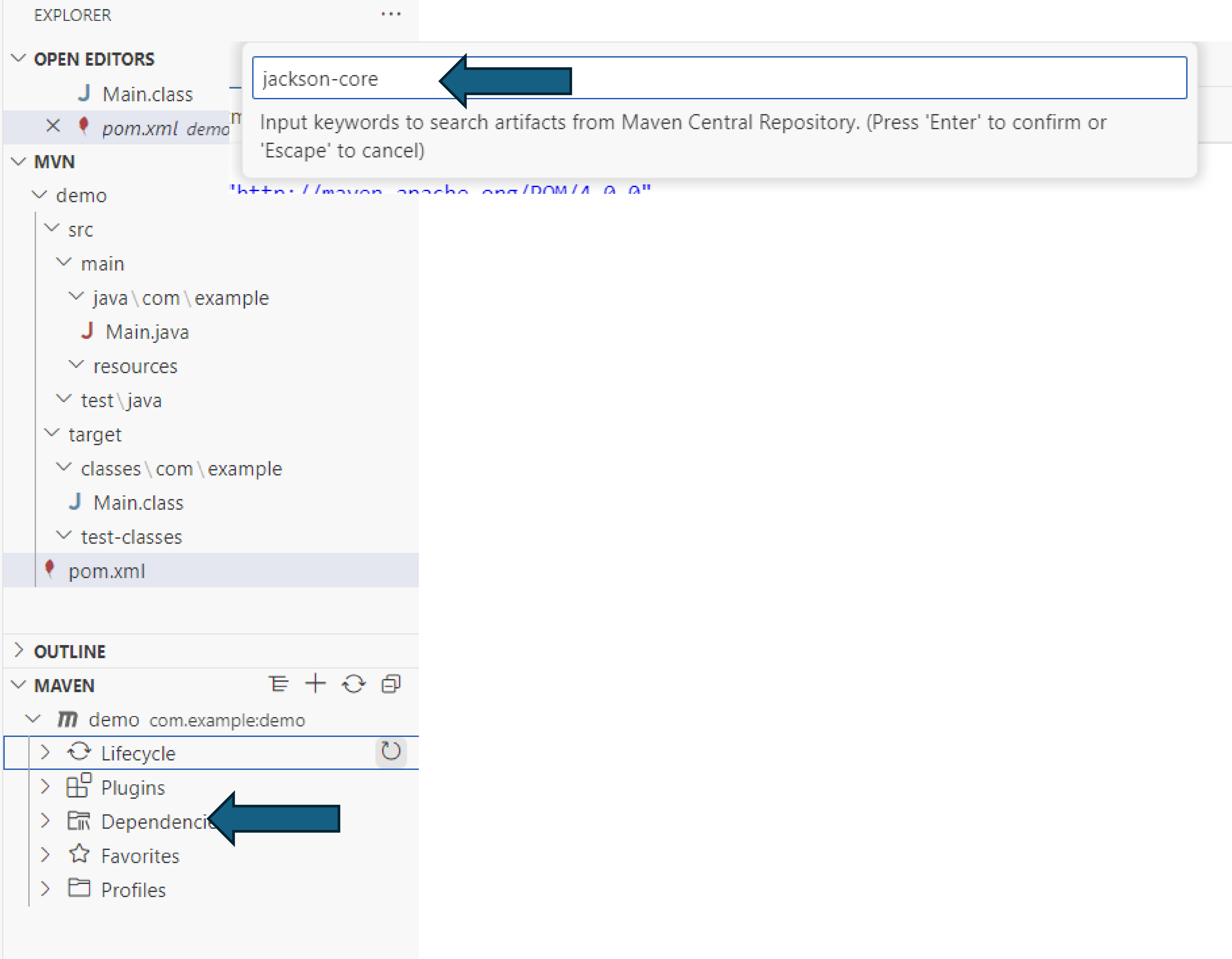
Overview

Description

Core Jackson processing abstractions (aka Streaming API), implementation for JSON

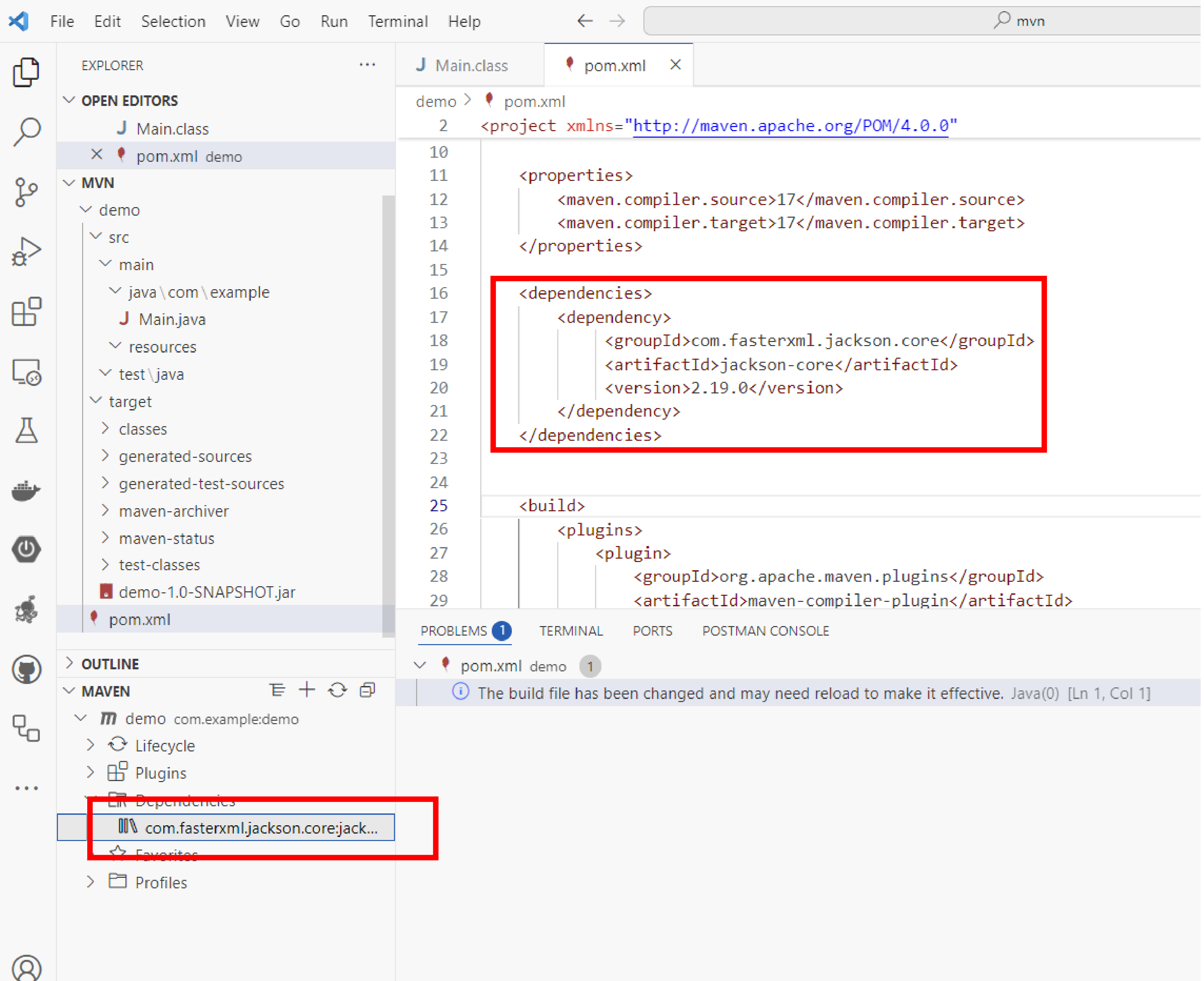
Snippets

```
<dependency>
    <groupId>com.fasterxml.jackson.core</groupId>
    <artifactId>jackson-core</artifactId>
    <version>2.19.0</version>
</dependency>
```



jackson-core

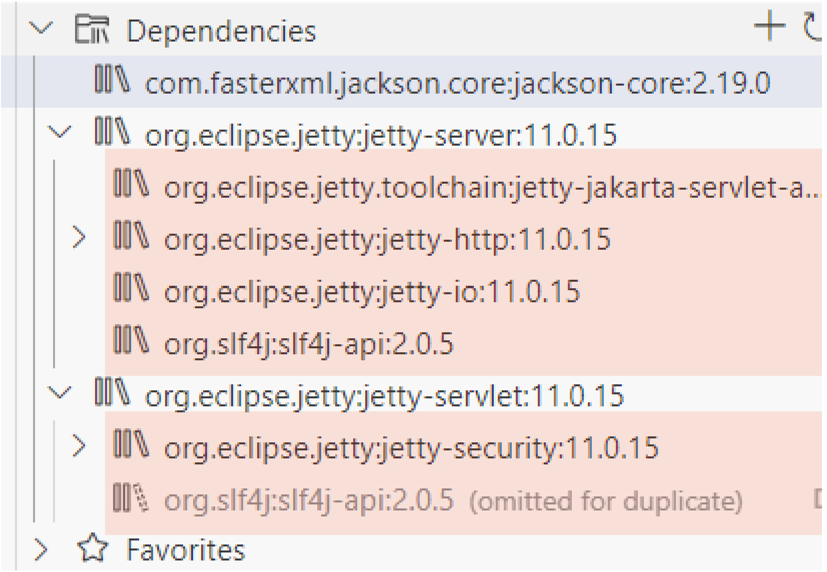
Input keywords to search artifacts from Maven Central Repository. (Press 'Enter' to confirm or 'Escape' to cancel)



```xml
<project xmlns="http://maven.apache.org/POM/4.0.0"

    <properties>
        <maven.compiler.source>17</maven.compiler.source>
        <maven.compiler.target>17</maven.compiler.target>
    </properties>

    <dependencies>
        <dependency>
            <groupId>com.fasterxml.jackson.core</groupId>
            <artifactId>jackson-core</artifactId>
            <version>2.19.0</version>
        </dependency>
    </dependencies>


    <build>
        <plugins>
            <plugin>
                <groupId>org.apache.maven.plugins</groupId>
                <artifactId>maven-compiler-plugin</artifactId>
```

ⓘ The build file has been changed and may need reload to make it effective. Java(0) [Ln 1, Col 1]

Maven identifies (in)direct dependencies



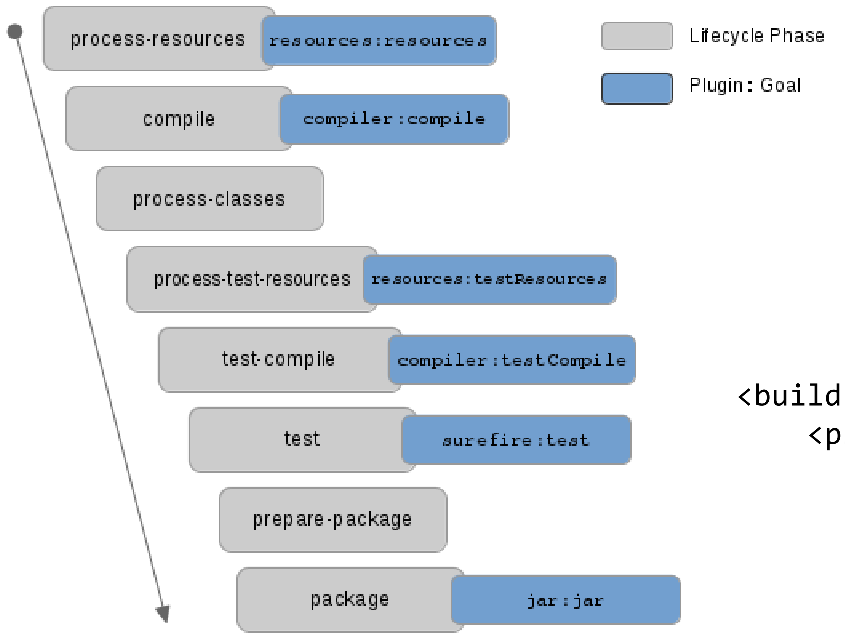
Dependencies
- com.fasterxml.jackson.core:jackson-core:2.19.0
- org.eclipse.jetty:jetty-server:11.0.15
  - org.eclipse.jetty.toolchain:jetty-jakarta-servlet-a...
  - org.eclipse.jetty:jetty-http:11.0.15
  - org.eclipse.jetty:jetty-io:11.0.15
  - org.slf4j:slf4j-api:2.0.5
- org.eclipse.jetty:jetty-servlet:11.0.15
  - org.eclipse.jetty:jetty-security:11.0.15
  - org.slf4j:slf4j-api:2.0.5 (omitted for duplicate)

Favorites

```
<dependencies>
       <dependency>
            <groupId>com.fasterxml.jackson.core</groupId>
            <artifactId>jackson-core</artifactId>
            <version>2.19.0</version>
       </dependency>
   <dependency>
       <groupId>org.eclipse.jetty</groupId>
       <artifactId>jetty-server</artifactId>
       <version>11.0.15</version>
   </dependency>
   <dependency>
       <groupId>org.eclipse.jetty</groupId>
       <artifactId>jetty-servlet</artifactId>
       <version>11.0.15</version>
   </dependency>
   </dependencies>
```

Some notes on plugins

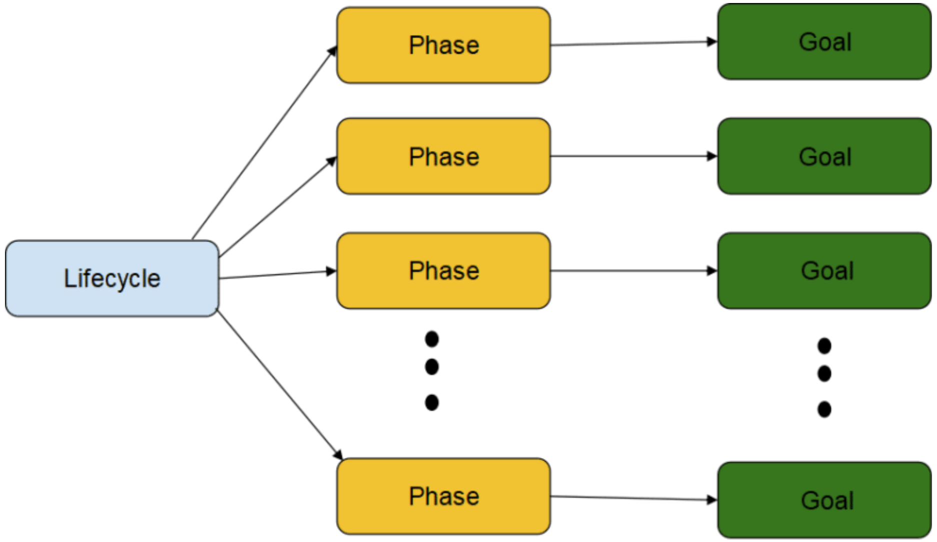
The pom.xml: plugins



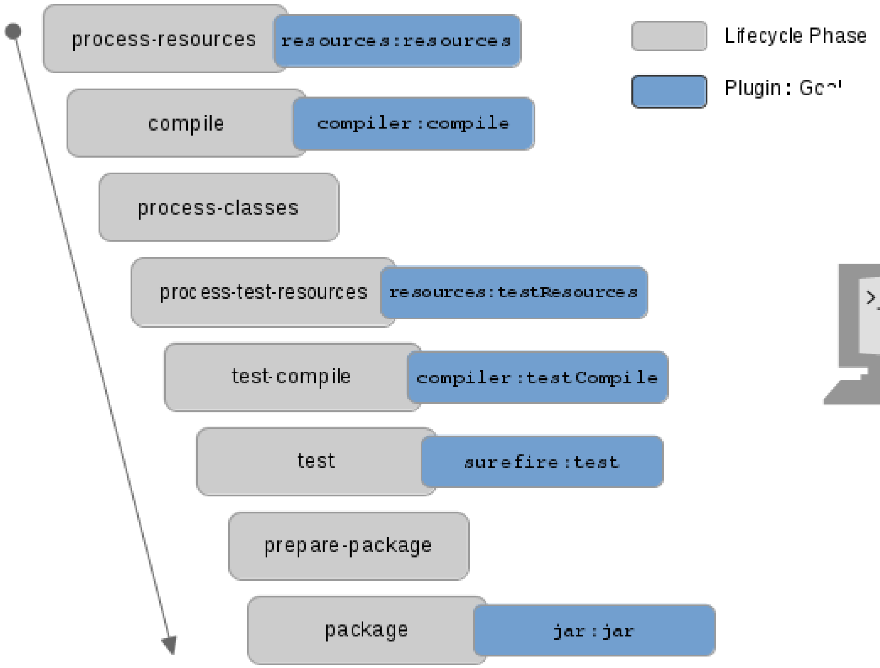
```
<build>
    <plugins>
        <plugin>
            <groupId>org.apache.maven.plugins</groupId>
            <artifactId>maven-compiler-plugin</artifactId>
            <version>3.8.1</version>
            <configuration>
                <source>17</source>
                <target>17</target>
            </configuration>
        </plugin>
    </plugins>
</build>
```

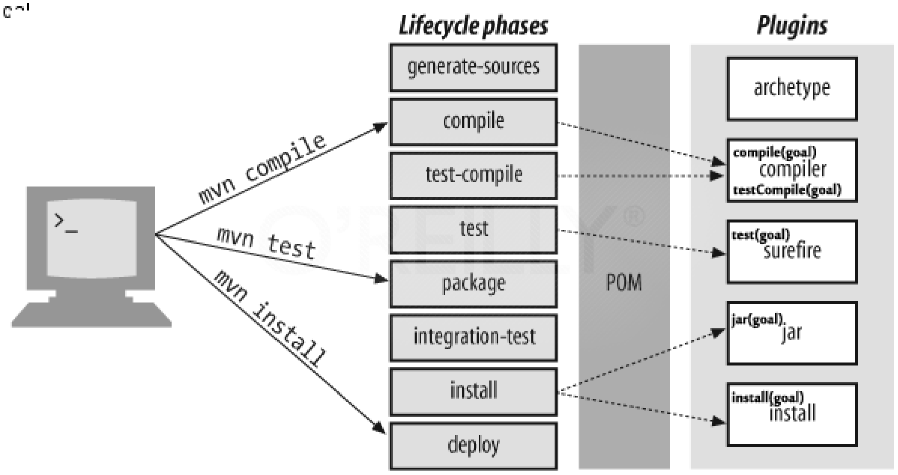
Lifecycle and Phases

- To perform various build operations, Apache Maven provides a variety of phases that admins can invoke on a project through the mvn command.

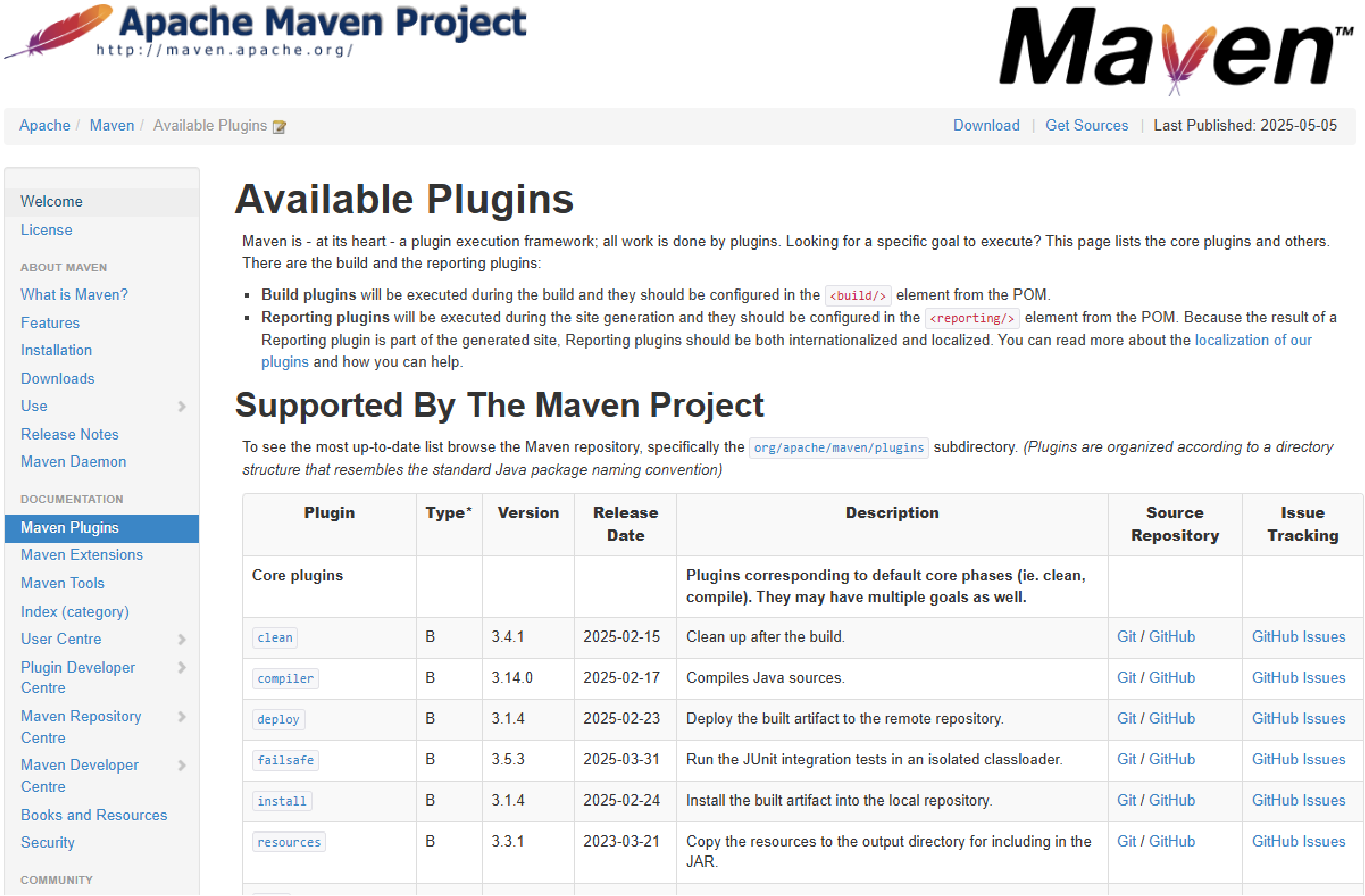


Running MAVEN – lifecycle or phases





https://maven.apache.org/guides/introduction/introduction-to-the-lifecycle.html



Available Plugins

Maven is - at its heart - a plugin execution framework; all work is done by plugins. Looking for a specific goal to execute? This page lists the core plugins and others. There are the build and the reporting plugins:

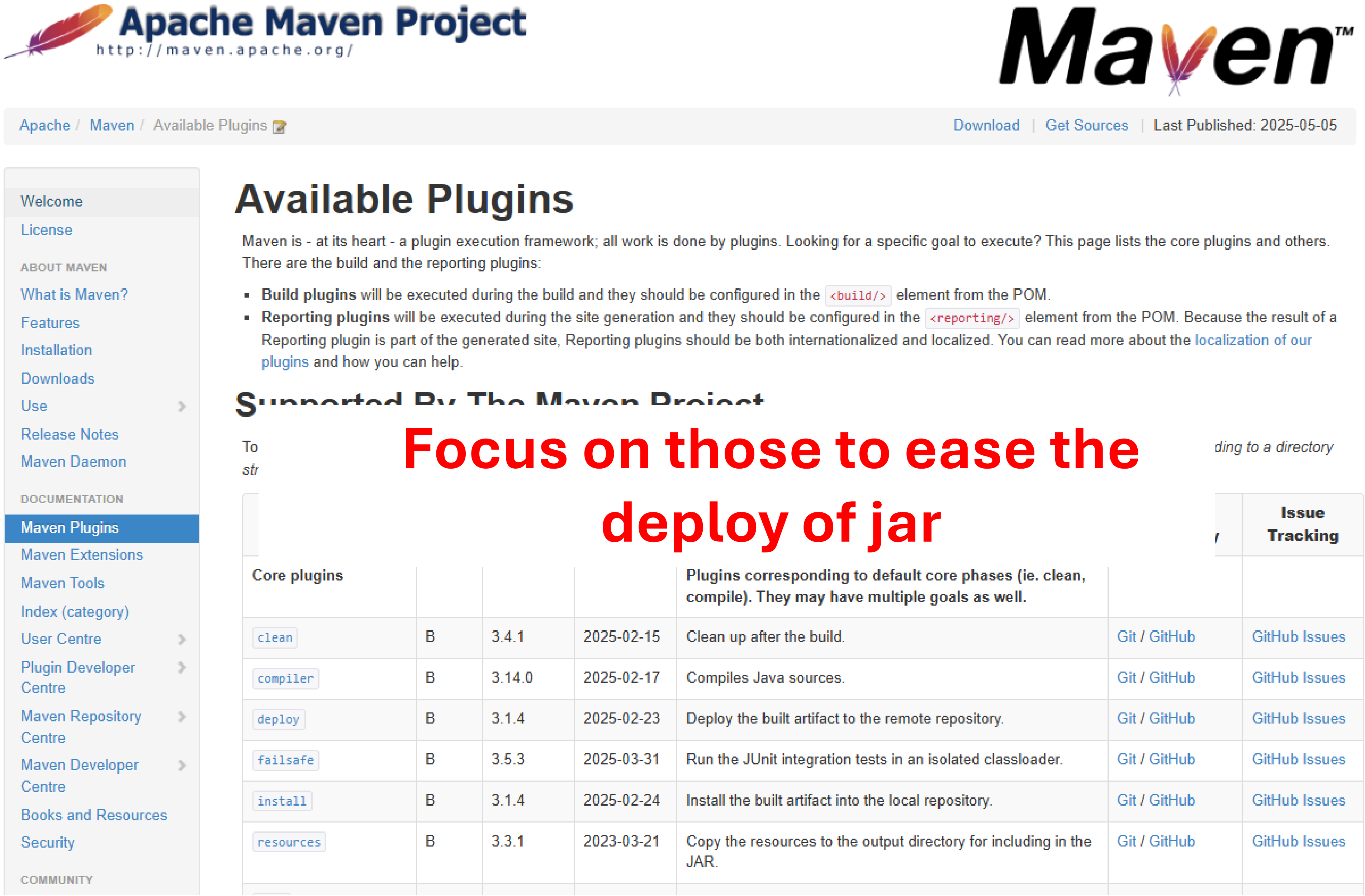
- **Build plugins** will be executed during the build and they should be configured in the `<build/>` element from the POM.
- **Reporting plugins** will be executed during the site generation and they should be configured in the `<reporting/>` element from the POM. Because the result of a Reporting plugin is part of the generated site, Reporting plugins should be both internationalized and localized. You can read more about the localization of our plugins and how you can help.

Supported By The Maven Project

To see the most up-to-date list browse the Maven repository, specifically the `org/apache/maven/plugins` subdirectory. *(Plugins are organized according to a directory structure that resembles the standard Java package naming convention)*

Plugin	Type*	Version	Release Date	Description	Source Repository	Issue Tracking
Core plugins				**Plugins corresponding to default core phases (ie. clean, compile). They may have multiple goals as well.**		
`clean`	B	3.4.1	2025-02-15	Clean up after the build.	Git / GitHub	GitHub Issues
`compiler`	B	3.14.0	2025-02-17	Compiles Java sources.	Git / GitHub	GitHub Issues
`deploy`	B	3.1.4	2025-02-23	Deploy the built artifact to the remote repository.	Git / GitHub	GitHub Issues
`failsafe`	B	3.5.3	2025-03-31	Run the JUnit integration tests in an isolated classloader.	Git / GitHub	GitHub Issues
`install`	B	3.1.4	2025-02-24	Install the built artifact into the local repository.	Git / GitHub	GitHub Issues
`resources`	B	3.3.1	2023-03-21	Copy the resources to the output directory for including in the JAR.	Git / GitHub	GitHub Issues

https://maven.apache.org/plugins/



Available Plugins

Maven is - at its heart - a plugin execution framework; all work is done by plugins. Looking for a specific goal to execute? This page lists the core plugins and others. There are the build and the reporting plugins:

- **Build plugins** will be executed during the build and they should be configured in the `<build/>` element from the POM.
- **Reporting plugins** will be executed during the site generation and they should be configured in the `<reporting/>` element from the POM. Because the result of a Reporting plugin is part of the generated site, Reporting plugins should be both internationalized and localized. You can read more about the localization of our plugins and how you can help.

Supported By The Maven Project

To … ding to a directory
str…

Focus on those to ease the deploy of jar

						Issue Tracking
Core plugins				**Plugins corresponding to default core phases (ie. clean, compile). They may have multiple goals as well.**		
`clean`	B	3.4.1	2025-02-15	Clean up after the build.	Git / GitHub	GitHub Issues
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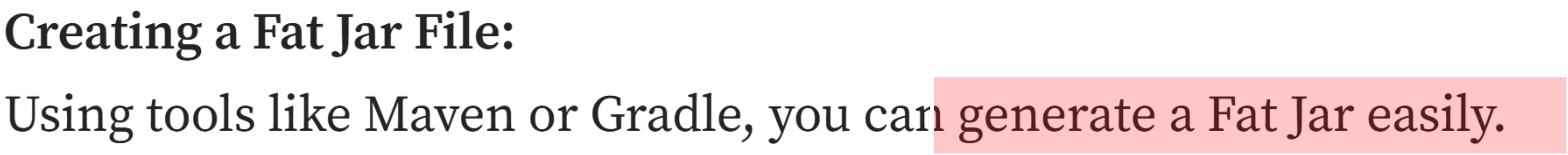
https://maven.apache.org/plugins/

Fat Jar Files

- Uber Jars or executable Jars,
- take the concept of Jar files a step further by
- include **all dependencies within the archive**.
- self-contained approach
  - simplifies deployment,
  - as the application can be run **without relying on external libraries.**



Creating a Fat Jar File:

Using tools like Maven or Gradle, you can generate a Fat Jar easily.

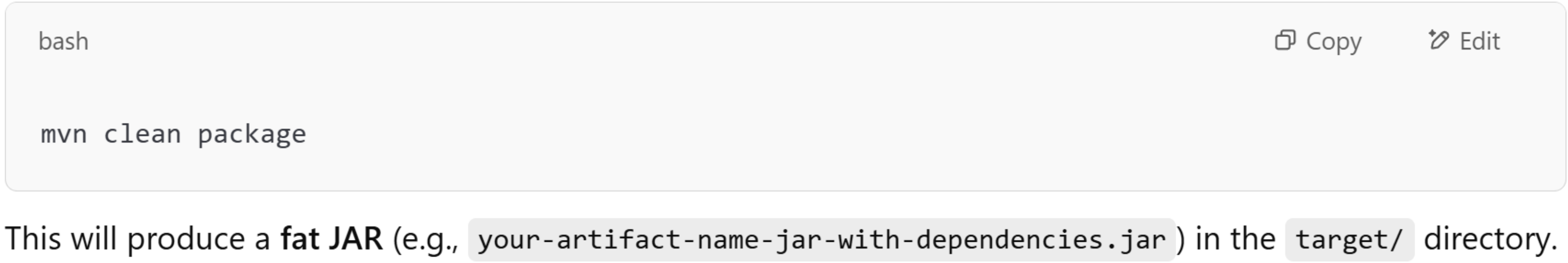
Use proper plugin in pom.xml

If you're using **Maven**, use the `maven-shade-plugin` in your `pom.xml`:

```
<build>
    <plugins>
        <plugin>
            <groupId>org.apache.maven.plugins</groupId>
            <artifactId>maven-shade-plugin</artifactId>
            <version>3.5.0</version>
            <executions>
                <execution>
                    <phase>package</phase>
                    <goals><goal>shade</goal></goals>
                    <configuration>
                        <transformers>
                            <transformer
implementation="org.apache.maven.plugins.shade.resource.ManifestResourceTransformer">

                                <mainClass>EmbeddedJettyExample</mainClass> <!-- Replace with your full
class name -->
                            </transformer>
                        </transformers>
                    </configuration>
                </execution>
            </executions>
        </plugin>
    </plugins>
</build>
```

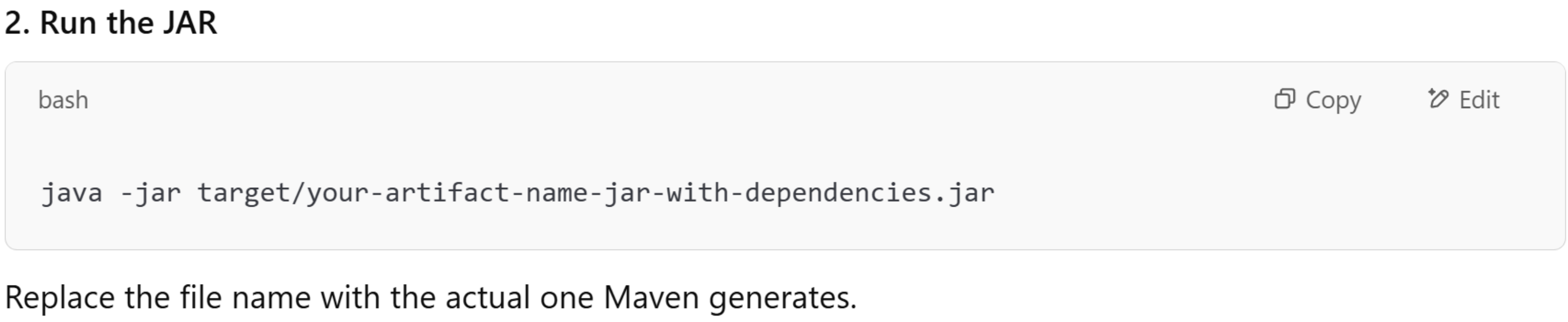
Create the jar



```bash
mvn clean package
```

This will produce a **fat JAR** (e.g., `your-artifact-name-jar-with-dependencies.jar`) in the `target/` directory.

run



2. Run the JAR

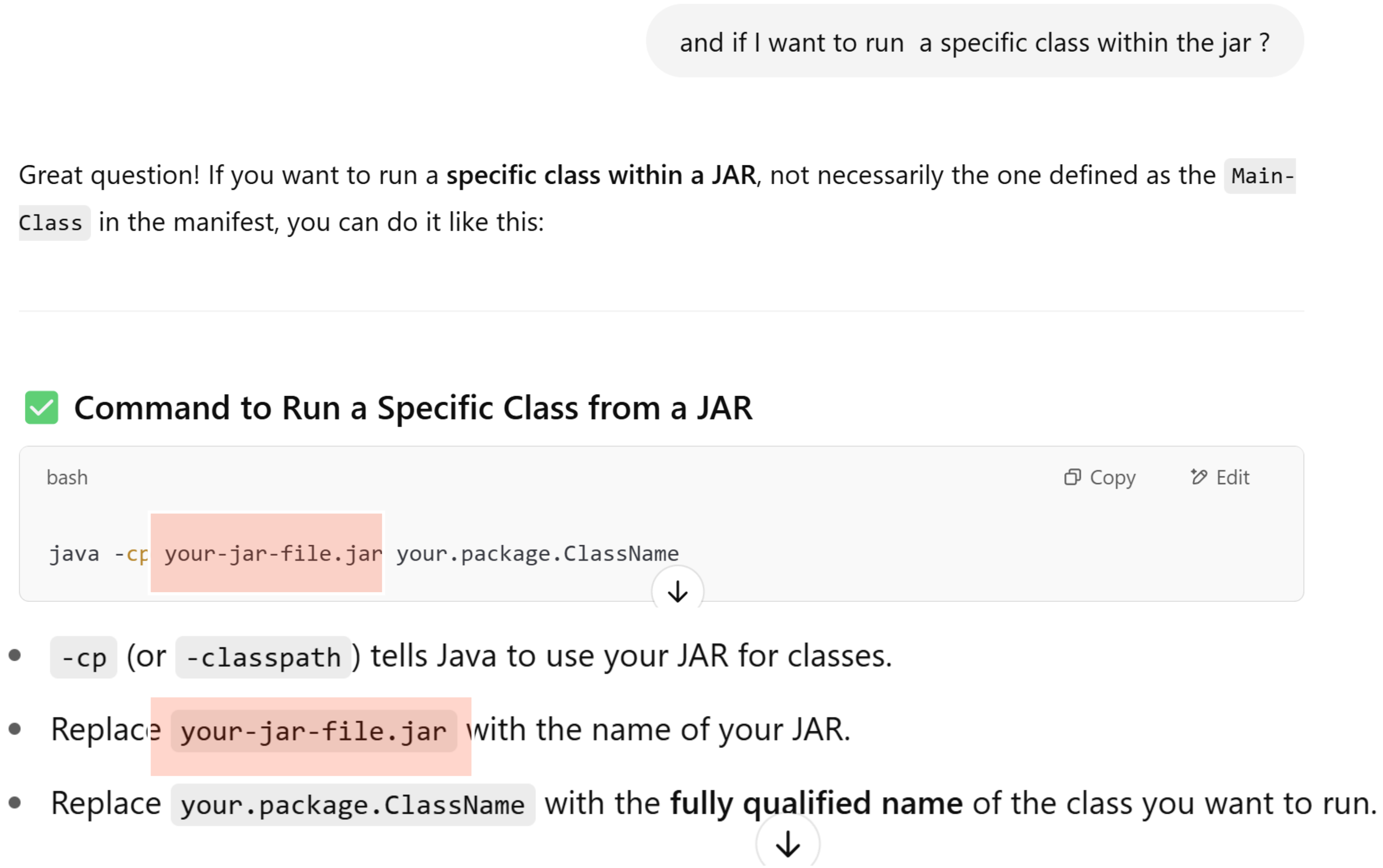
```bash
java -jar target/your-artifact-name-jar-with-dependencies.jar
```

Replace the file name with the actual one Maven generates.

It will run the class plugin field…

```
<mainClass>EmbeddedJettyExample</mainClass><!-- Replace with your full class name -->
```

and if I want to run a specific class?



and if I want to run a specific class within the jar ?

Great question! If you want to run a **specific class within a JAR**, not necessarily the one defined as the `Main-Class` in the manifest, you can do it like this:

✅ Command to Run a Specific Class from a JAR

```bash
java -cp your-jar-file.jar your.package.ClassName
```

- `-cp` (or `-classpath`) tells Java to use your JAR for classes.
- Replace `your-jar-file.jar` with the name of your JAR.
- Replace `your.package.ClassName` with the **fully qualified name** of the class you want to run.

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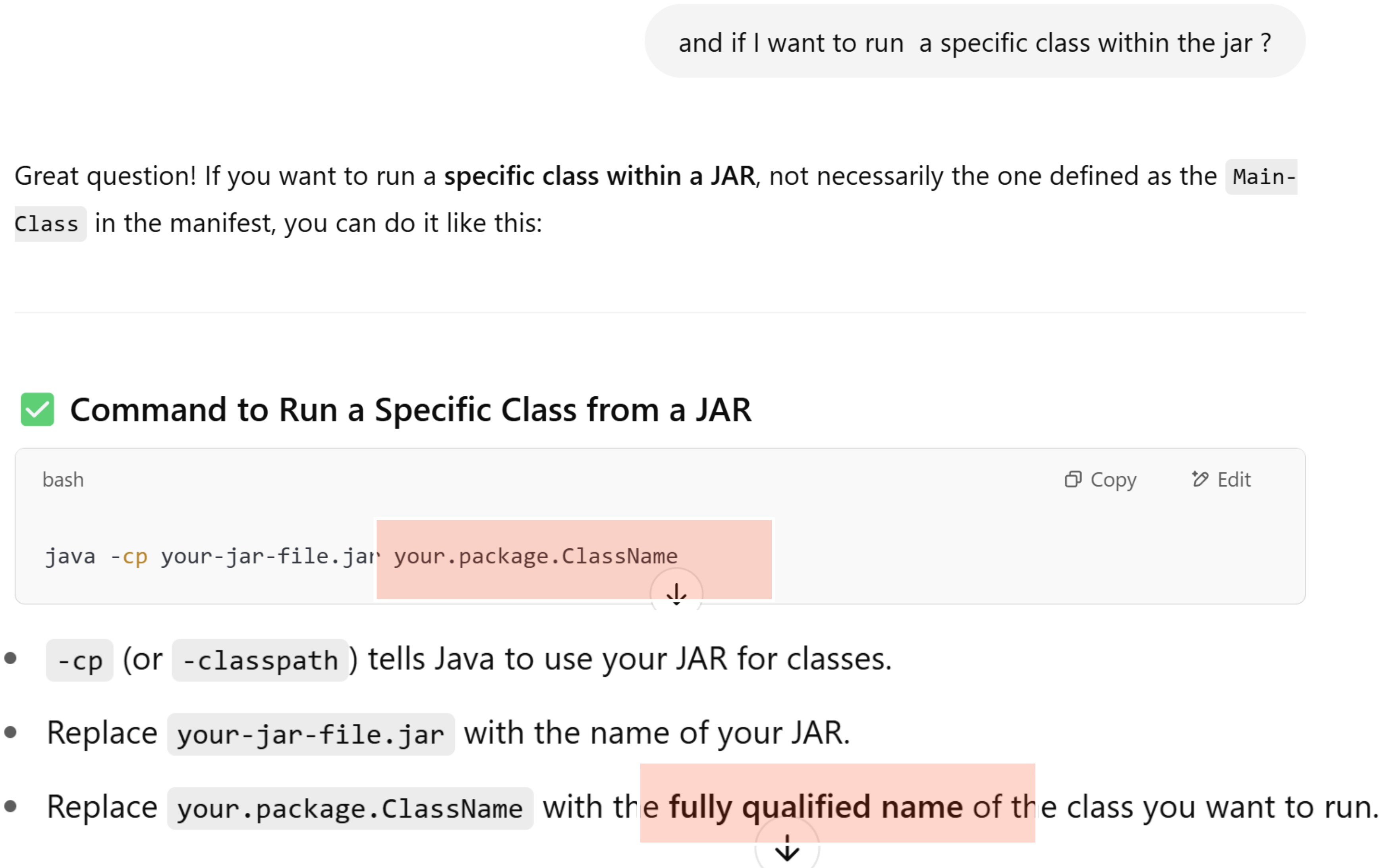

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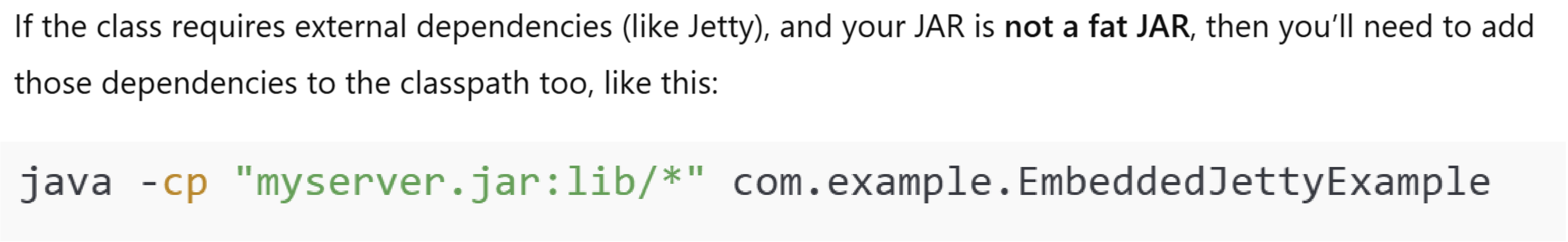
If your jar does not have all dependencies...



If the class requires external dependencies (like Jetty), and your JAR is **not a fat JAR**, then you'll need to add those dependencies to the classpath too, like this:

```
java -cp "myserver.jar:lib/*" com.example.EmbeddedJettyExample
```

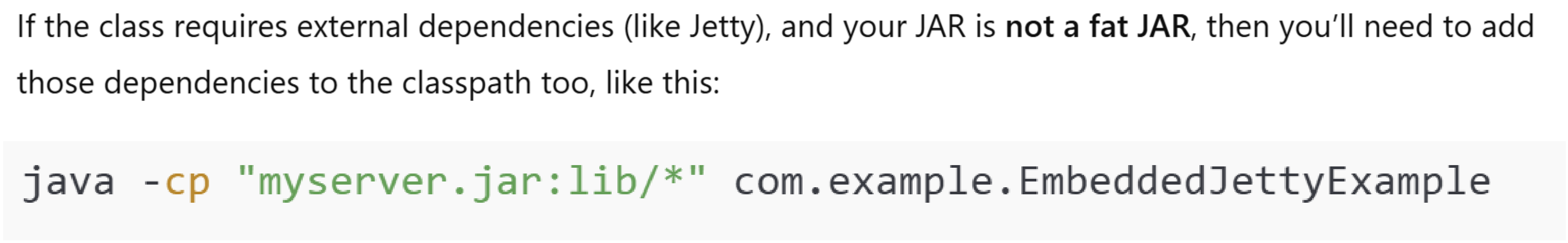
The jar with your code ...

```
myserver.jar
```

directory(ie) containing all
dependencies that are OUTSIDE the jar

```
lib/*
```

If your jar does not have all dependencies...



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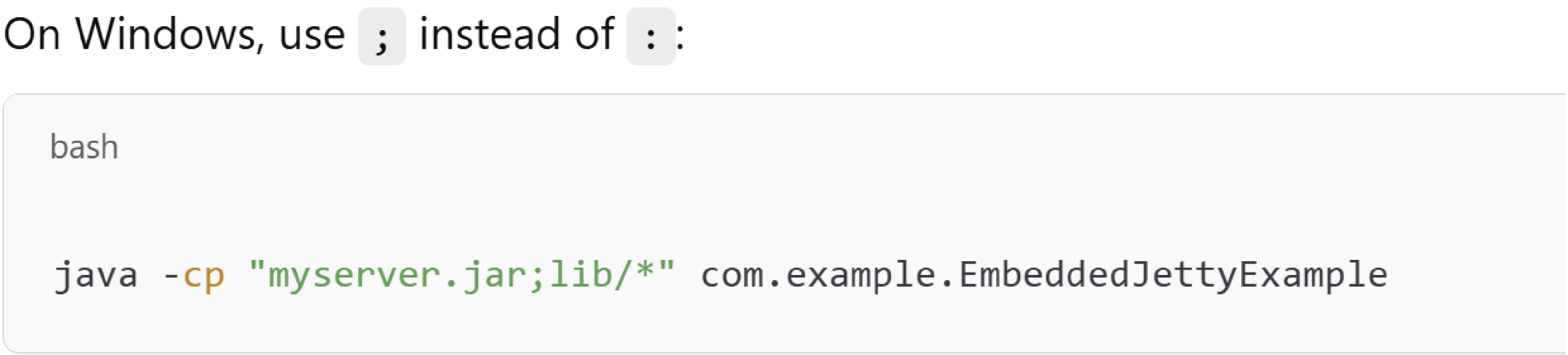
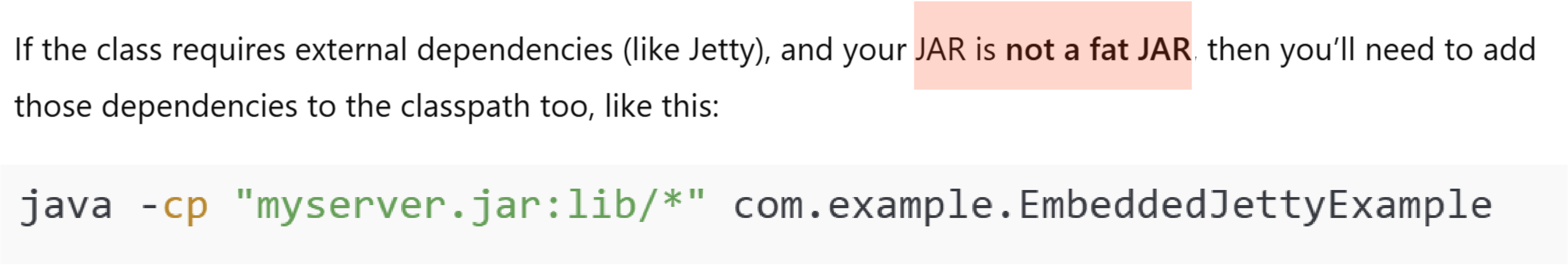


On Windows, use `;` instead of `:`:

```bash
java -cp "myserver.jar;lib/*" com.example.EmbeddedJettyExample
```

If your jar does not have all dependencies...



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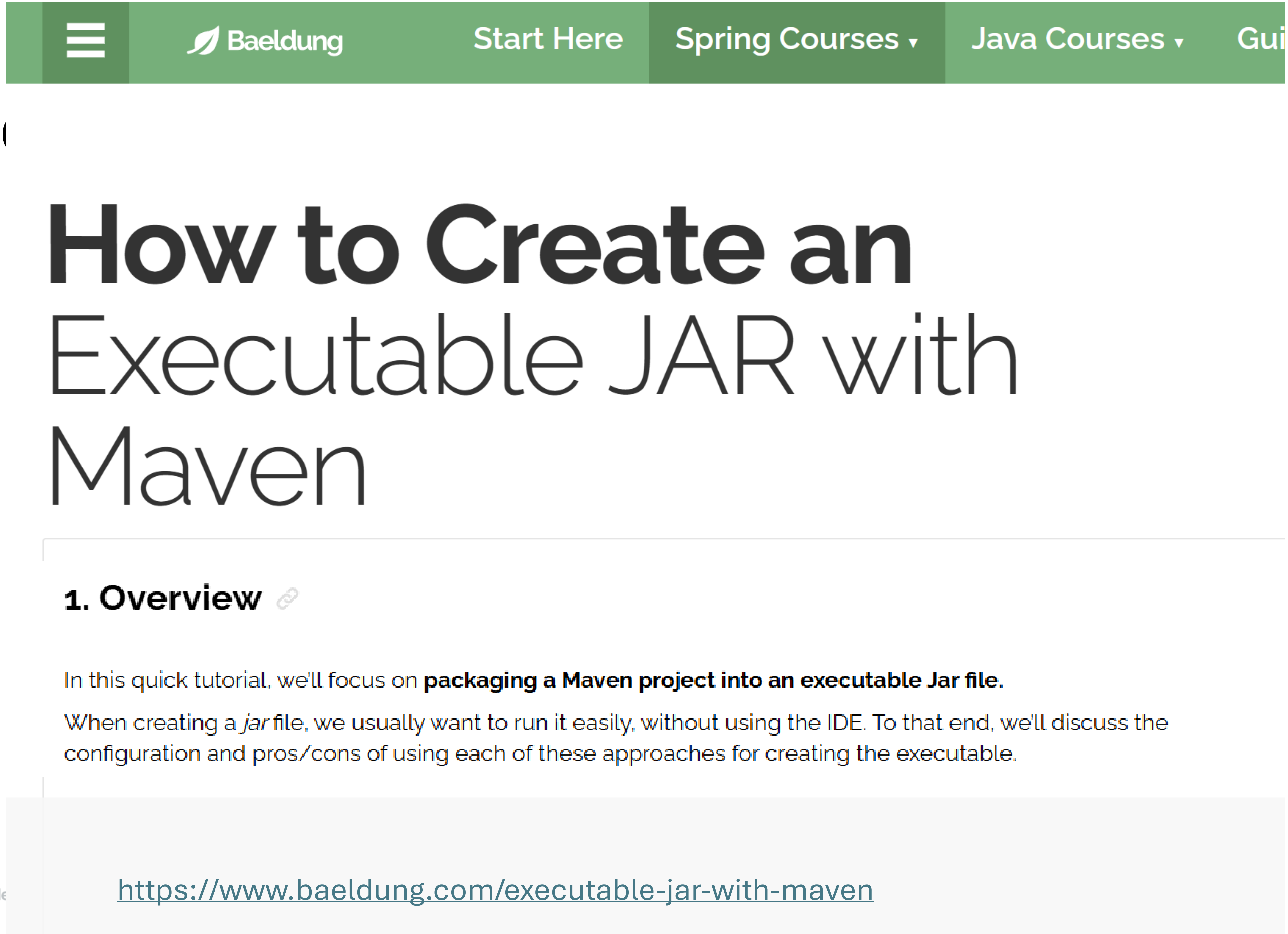
```

Th



How to Create an Executable JAR with Maven

1. Overview

In this quick tutorial, we'll focus on **packaging a Maven project into an executable Jar file.**

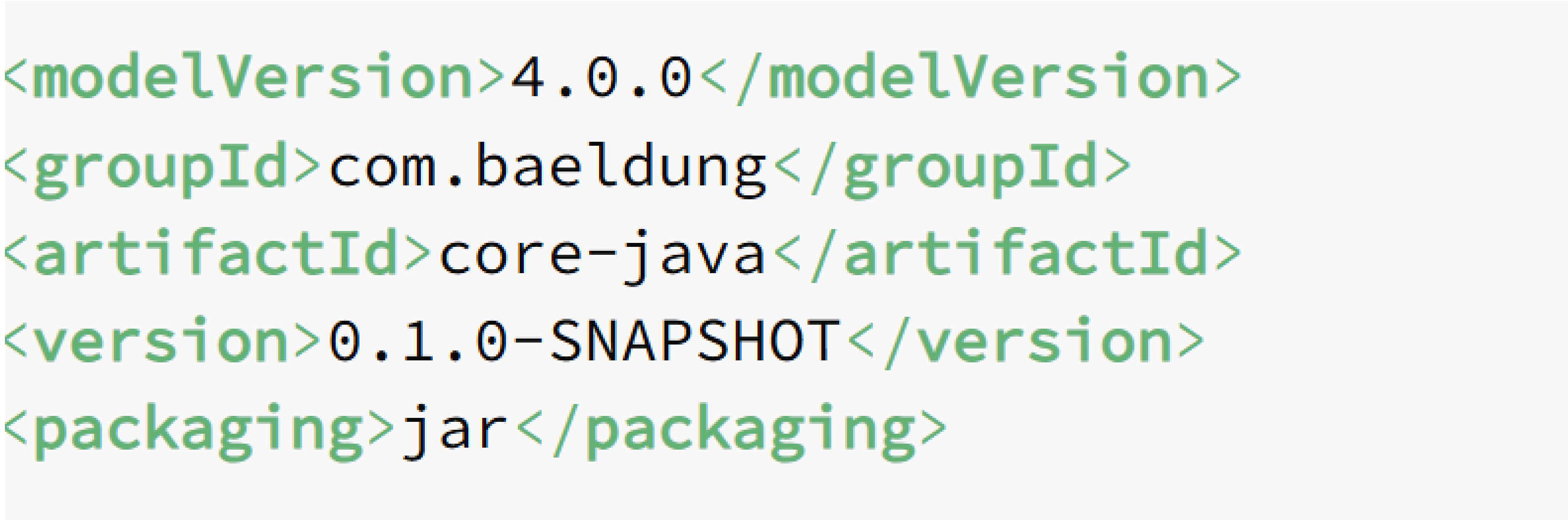
When creating a *jar* file, we usually want to run it easily, without using the IDE. To that end, we'll discuss the configuration and pros/cons of using each of these approaches for creating the executable.

https://www.baeldung.com/executable-jar-with-maven

How to Create an Executable JAR with Maven

The most important aspect here is the type — to create an executable *jar*, double-check the configuration uses a *jar* type.

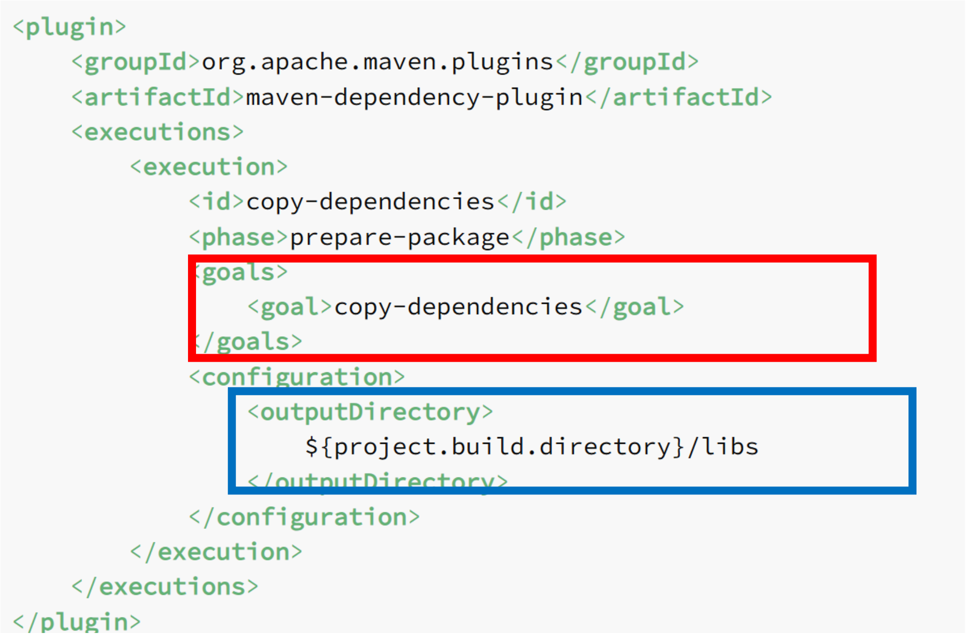
- Now we can start using the various solutions.



```
<modelVersion>4.0.0</modelVersion>
<groupId>com.baeldung</groupId>
<artifactId>core-java</artifactId>
<version>0.1.0-SNAPSHOT</version>
<packaging>jar</packaging>
```

Goal – copy dependencies

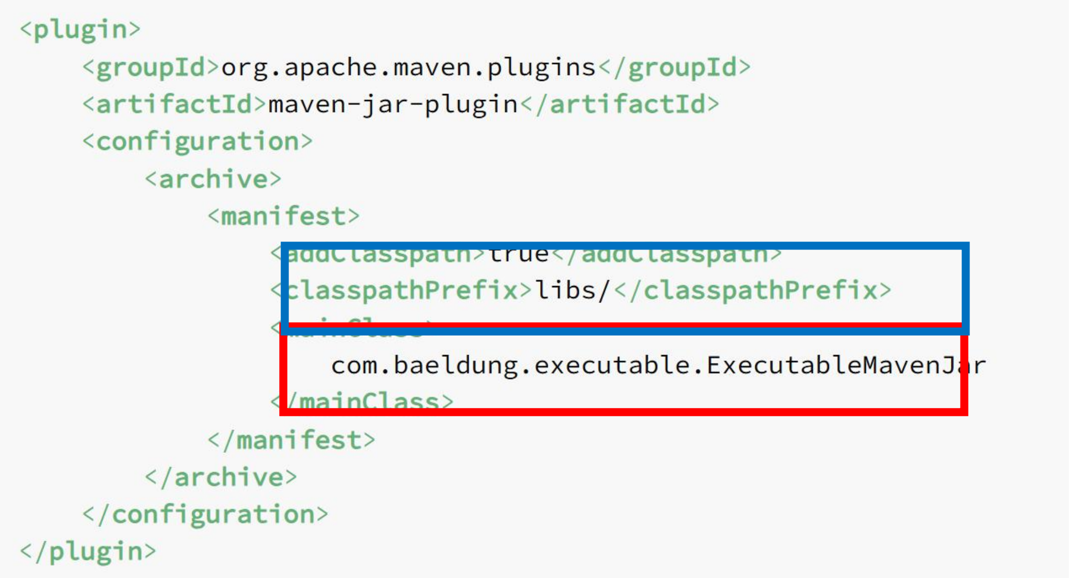
- specify the ***goal copy-dependencies***,
- copy dependencies into the specified ***outputDirectory*** **i.e. a folder *libs* inside the project build directory (which is usually the *target* folder).**



```
<plugin>
    <groupId>org.apache.maven.plugins</groupId>
    <artifactId>maven-dependency-plugin</artifactId>
    <executions>
        <execution>
            <id>copy-dependencies</id>
            <phase>prepare-package</phase>
            <goals>
                <goal>copy-dependencies</goal>
            </goals>
            <configuration>
                <outputDirectory>
                    ${project.build.directory}/libs
                </outputDirectory>
            </configuration>
        </execution>
    </executions>
</plugin>
```

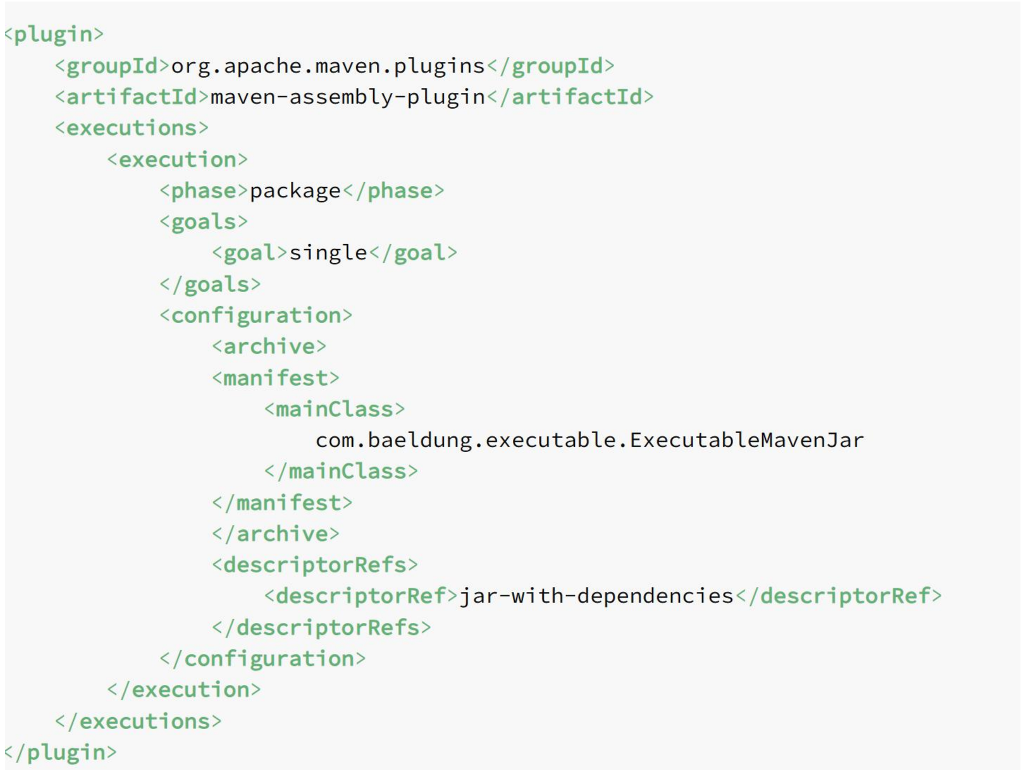
Maven jar plugin

- the *manifest* configuration. **We add a classpath, with all dependencies (folder *libs/*)**, and provide the information about the main class.
- need to provide a fully qualified name of the class, which means it will include the package name.



```
<plugin>
    <groupId>org.apache.maven.plugins</groupId>
    <artifactId>maven-jar-plugin</artifactId>
    <configuration>
        <archive>
            <manifest>
                <addClasspath>true</addClasspath>
                <classpathPrefix>libs/</classpathPrefix>
                <mainClass>
                    com.baeldung.executable.ExecutableMavenJar
                </mainClass>
            </manifest>
        </archive>
    </configuration>
</plugin>
```

Apache Maven Assembly Plugin



```xml
<plugin>
    <groupId>org.apache.maven.plugins</groupId>
    <artifactId>maven-assembly-plugin</artifactId>
    <executions>
        <execution>
            <phase>package</phase>
            <goals>
                <goal>single</goal>
            </goals>
            <configuration>
                <archive>
                <manifest>
                    <mainClass>
                        com.baeldung.executable.ExecutableMavenJar
                    </mainClass>
                </manifest>
                </archive>
                <descriptorRefs>
                    <descriptorRef>jar-with-dependencies</descriptorRef>
                </descriptorRefs>
            </configuration>
        </execution>
    </executions>
</plugin>
```

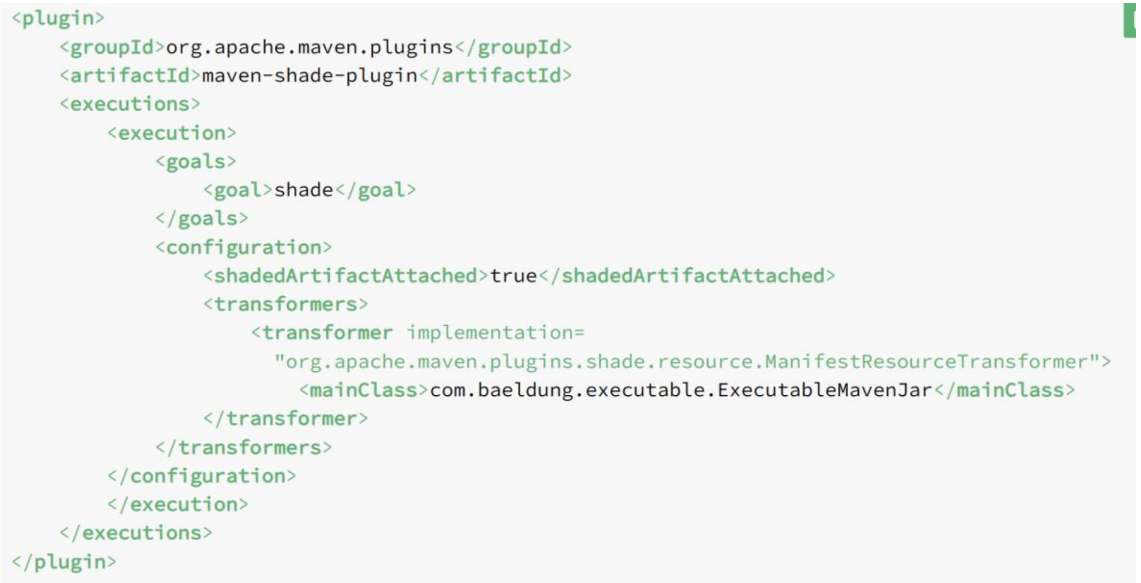
Similarly to the manual approach, we need to provide the information about the main class. The difference is that the Maven Assembly Plugin will automatically copy all required dependencies into a *jar* file.

In the *descriptorRefs* part of the configuration code, we provided the name that will be added to the project name.

Output in our example will be named *core-java-jar-with-dependencies.jar*.

- **pros** – dependencies inside the *jar* file, one file only
- **cons** – basic control of packaging our artifact, for example, there is no class relocation support

Apache Maven Shade Plugin



```
<plugin>
    <groupId>org.apache.maven.plugins</groupId>
    <artifactId>maven-shade-plugin</artifactId>
    <executions>
        <execution>
            <goals>
                <goal>shade</goal>
            </goals>
            <configuration>
                <shadedArtifactAttached>true</shadedArtifactAttached>
                <transformers>
                    <transformer implementation=
                     "org.apache.maven.plugins.shade.resource.ManifestResourceTransformer">
                       <mainClass>com.baeldung.executable.ExecutableMavenJar</mainClass>
                </transformer>
            </transformers>
        </configuration>
        </execution>
    </executions>
</plugin>
```

There are three main parts to this configuration.

First, *<shadedArtifactAttached>* marks all dependencies to be packaged into the *jar*.

Second, we need to specify the transformer implementation; we used the standard one in our example.

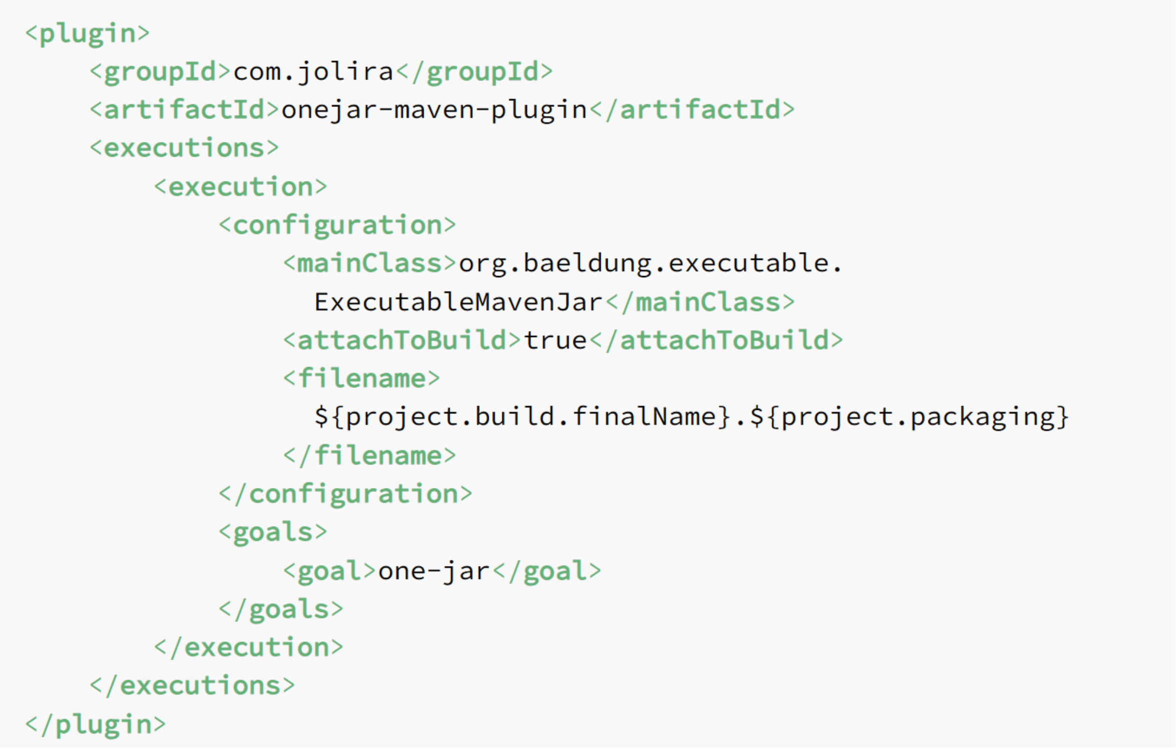
Finally, we need to specify the main class of our application.

The output file will be named *core-java-0.1.0-SNAPSHOT-shaded.jar*, where *core-java* is our project name followed by snapshot version and plugin name.

- **pros** – dependencies inside the *jar* file, advanced control of packaging our artifact, with shading and class relocation

- **cons** – complex configuration (especially if we want to use advanced features)

One Jar Maven Plugin



```
<plugin>
    <groupId>com.jolira</groupId>
    <artifactId>onejar-maven-plugin</artifactId>
    <executions>
        <execution>
            <configuration>
                <mainClass>org.baeldung.executable.
                  ExecutableMavenJar</mainClass>
                <attachToBuild>true</attachToBuild>
                <filename>
                  ${project.build.finalName}.${project.packaging}
                </filename>
            </configuration>
            <goals>
                <goal>one-jar</goal>
            </goals>
        </execution>
    </executions>
</plugin>
```

Another option to create an executable *jar* is the One Jar project.

- This provides a custom class loader that knows how to load classes and resources from jars inside an archive, instead of from *jars* in the filesystem.

As shown in the configuration, we need to specify the main class and attach all dependencies to the build, by using *attachToBuild = true*.

Also, we should provide the output filename. Moreover, the goal for Maven is *one-jar*. Please note that One Jar is a commercial solution that will make dependency *jars* not expanded into the filesystem at runtime.

- **pros** – clean delegation model, allows classes to be at the top level of the One Jar, supports external *jars*, and can support Native libraries
- **cons** – not actively supported since 2012

What was addressed

- Maven (focus in java)
  - pom.xml
  - dependencies and plugins
  - adding dependencies
- deploy a java application
  - jar and fat jar
  - the maven pluggins to deploy
-

The END

Some links on maven

- Apache Maven Series
  - https://www.baeldung.com/maven-series
- Getting Started With Maven - A Beginner's Guide to Efficient Java Build Management
  - https://hackernoon.com/getting-started-with-maven-a-beginners-guide-to-efficient-java-build-management
- Maven in 5 Minutes
  - https://maven.apache.org/guides/getting-started/maven-in-five-minutes.html
- Maven Getting Started Guide
  - https://maven.apache.org/guides/getting-started/