

The screenshot shows the JFrog Artifactory web interface. On the left is a dark sidebar with various links like 'Kali Linux', 'Kali Tools', 'Kali Docs', etc. The main area has a header 'Artifacts' and a search bar 'Search Artifacts'. Below it, a message says 'Happily serving 0 artifacts'. A tree view on the left shows 'artifactory-build-info', 'example-repo-local', and 'tektutor' (which is selected). The right side shows detailed information for the 'tektutor' repository, including fields for Name (tektutor), Package Type (Maven), Repository Path (tektutor), URL to file (http://localhost:8082/artifactory/tektutor/), Repository Layout (maven-2-default), and Created (06-12-23 09:57:12 +00:00). There are tabs for General, Effective Permissions, Properties, and Followers.

Day1

Checking the maven version on your RPS Lab machine

```
mvn --version
```

Expected output

```
└──(jegan@tektutor.org) - [~/Downloads/apache-maven-3.9.6]
└─$ mvn --version
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
Apache Maven 3.9.6 (bc0240f3c744dd6b6ec2920b3cd08dcc295161ae)
Maven home: /home/jegan/Downloads/apache-maven-3.9.6
Java version: 17.0.9-ea, vendor: Debian, runtime: /usr/lib/jvm/java-17-openjdk-amd64
Default locale: en_US, platform encoding: UTF-8
OS name: "linux", version: "6.4.0-kali3-amd64", arch: "amd64", family: "unix"
```

What is Agile?

- Fail-fast
-

SCRUM

- Daily stand-up meeting

- What is the purpose of this meeting?
 - Discuss road-blocks, impediments
 - share updates
 - it is a fail-fast meeting
 - inspect plan & adapt meeting

What is DevOps?

- fail-fast engineering process that helps catch the defects as soon as it is injected/introduced into code
- projects that follow Devops, the team members would be committing the source code several times a day
- the code written by developers will be integrated to the dev branch several times a day, only then we will be catch the defects as soon as they are injected into the stable code
- automated test cases are very crucial to find the bugs early during the development cycle
- converting manual efforts into code as much as possible
- Developers, QA, Operations Team

What is Continuous Integration (CI)?

- the developers add automated unit testing and integrating testing as part of the features they integrate
- developers will be following Test Driven Development (TDD)
- once the code is committed
- scope of automated testing is restricted to unit and integration testing

What is Continuous Deployment (CD)?

- the application binary that passed all the automated test cases added by dev team will be deployed automatically into QA environment automatically
- automated test cases
 - smoke test
 - sanity test
 - end to end functional testing
 - component/API test
 - stress, load & performance testing

What is Continuous Delivery (CD)?

- QA team certified builds are automatically delivered to customer's production like environment for further testing and manual approval
- Continuous Delivery could even deploy the application binaries to live production environment

Who all are impacted by DevOps?

- You might be Developer, QA, System Administrator, DBA, Infra Engineer
- Developers
 - 20 years no developers would have done automated testing
 - today, whichever team follows DevOps, every developer must know Unit Testing Frameworks and TDD

- Java Developers
 - JUnit/TestNG
 - Mockito/JMock/EasyMock,PowerMock
- C/C++
 - CppUnit,CUnit
 - Google Test/Mock
- JavaScript/TypeScript,ReactJS, AngularJS
 - Jasmine/Karma
- C#(.Net)
 - NUnit/MS Test
 - Moq
- manual developer testing activity should be converted into automated test cases by writing code
- developers in this process will learn little bit of QA skills
- developers also are expected to learn little of administration automating activities
 - configuration management tools (Ansible, Chef, Puppet, Salt)
- developers has learn little bit of QA & Admin skills (automation)
- QA Engineers
 - they need to learn programming to the extent they know how to do white box testing, automating functional, component, API test, load, stress, etc
 - Selenium
 - BDD Frameworks
 - they also need learn little bit of administration skills (Ansible, Puppet, Chef, Salt/Saltstack)
- Operations Team
 - need to learn infrastructure automation tools to provision machines locally or on cloud
 - need to learn configuration management tools to automate software installations & configurations

What is Apache Ant?

- build tool mostly used by Java based projects
- open source tool developed by Apache Foundation
- When Apache Foundation used Ant build for one of their complex product called Jakarta, they realized Ant build tools lacks the following
 - the use of XML to capture build instructions doesn't suit well and doesn't scale well for complex projects
 - dependency management
 - convention or standards - best practices

What is Apache Maven?

- build tool used mostly by Java based projects
- however, it can be used to build other language stack projects as well like C++, C#, etc.,
- it is language agnostic build tool
- supports
 - dependency management
 - has conventions for pretty everything

- it has conventions on how to name your projects
- it has conventions on how to track various version of your components/artifacts
- though Maven also uses XML file, it doesn't capture build instructions, instead just has project name, its dependency, etc.,
- it is object oriented build tool
- it uses repositories
 - supports 3 types of repositories
 1. Local (user home .m2 folder)
 2. Private (has proprietary lib/framework jar and open source lib/framework jars and plugins)
 3. Central Repository (Web site that has all open sources lib/framework jars and plugins)

What are Maven coordinates

- Maven has conventions for even on how we should name our projects
- the combination of all the 3 coordinates are supposed to unique
- Maven uses following 3 coordinates
 - 1. GroupId
 - 2. ArtifactId
 - 3. Version
- GroupId
 - your organization's reverse domain name (Eg: tektutor.org is my startup domain name, reverse domain would be org.tektutor)
 - string
- ArtifactId
 - is the name of the packaged application binary
 - i.e. name of the jar/war/ear/zip etc.,
- Version
 - x.y.z
 - x - represents major version
 - y - represents minor version
 - z - represents incremental version

Info - Maven Convention over Configuration

- this is based 80-20 Principle
- as per 80-20 Principle, they say if you consider any product, 80% of the times we use only 20% of the features of any product
- those 20% of the features which are commonly used shall be identified and it should be implemented in such a way it is easy to use
- most features which are rarely used must be supported, but it is ok if it requires hopping between multiple menu pages to reach out to the advanced features. As these advanced features are generally

used by Expert users, that too rarely.

- 80% of the times, maven build tool will be used by Java based projects
- In some rare cases, maven build tool could also be used to build C++/C# projects, maven also supports such use-cases
- But using maven to build C++/C# projects are rare, we may have to configure maven as those projects may or may not follow all the Maven conventions
- If we follow Maven conventions, then we need to do little to no configurations, if we can't follow maven conventions, then we need to do more configurations

Lab - Installing tree utility

When the below prompts for password type 'rps@12345' as the password without quotes.

```
sudo yum install -y tree
```

Lab - Cloning this TekTutor code repository (from the terminal) - One time activity

```
cd ~  
git clone https://github.com/tektutor/devops-dec-2023.git  
cd devops-dec-2023
```

Lab - Pulling delta changes everytime a new commit is done (this is done pretty much always)

```
cd ~/devops-dec-2023  
git pull
```

Lab - Building your first maven project

```
cd ~/devops-dec-2023  
git pull  
cd Day1/hello  
cat pom.xml  
cat src/main/java/org/tektutor/Hello.java  
mvn compile
```

Expected output

```
jegan@tektutor: ~/devops-dec-2023/Day1/hello

10 directories, 3 files

[jegan@tektutor.org]-(~/devops-dec-2023/Day1/hello]
$ cat pom.xml
<project>
    <modelVersion>4.0.0</modelVersion>

    <groupId>org.tektutor</groupId>
    <artifactId>hello</artifactId>
    <version>1.0.0</version>
</project>

[jegan@tektutor.org]-(~/devops-dec-2023/Day1/hello]
$ cat src/main/java/org/tektutor/Hello.java
package org.tektutor;

public class Hello {

    public String sayHello() {
        return "Hello World!";
    }

    public static void main ( String[] args ) {
        Hello hello = new Hello();
        System.out.println ( hello.sayHello() );
    }
}

[jegan@tektutor.org]-(~/devops-dec-2023/Day1/hello]
$ mvn compile
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.tektutor:hello >-----
[INFO]
```

```
jegan@tektutor: ~/devops-dec-2023/Day1/hello

public class Hello {
    public String sayHello() {
        return "Hello World!";
    }

    public static void main ( String[] args ) {
        Hello hello = new Hello();
        System.out.println ( hello.sayHello() );
    }
}

(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
$ mvn compile
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.tektutor:hello >-----
[INFO] Building hello 1.0.0
[INFO]   from pom.xml
[INFO] -----[ jar ]-----
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-resources-plugin/3.3.1/maven-resources-plugin-3.3.1.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-resources-plugin/3.3.1/maven-resources-plugin-3.3.1.pom (8.2 kB at 30 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-plugins/39/maven-plugins-39.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-plugins/39/maven-plugins-39.pom (8.1 kB at 405 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/39/maven-parent-39.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/39/maven-parent-39.pom (48 kB at 1.5 MB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/apache/29/apache-29.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/apache/29/apache-29.pom (21 kB at 1.3 MB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-resources-plugin/3.3.1/maven-resources-plugin-3.3.1.jar
jegan@tektutor: ~/devops-dec-2023/Day1/hello
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-component-annotations/1.5.5/plexus-component-annotations-1.5.5.jar (4.2 kB at 211 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-compiler-api/2.13.0/plexus-compiler-api-2.13.0.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/ow2/asm/asm/9.4/asm-9.4.jar (122 kB at 5.6 MB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-utils/3.5.0/plexus-utils-3.5.0.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-java/1.1.2/plexus-java-1.1.2.jar (55 kB at 1.8 MB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-compiler-manager/2.13.0/plexus-compiler-manager-2.13.0.jar
Downloaded from central: https://repo.maven.apache.org/maven2/com/thoughtworks/qdox/qdox/2.0.3/qdox-2.0.3.jar (334 kB at 9.0 MB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-compiler-javac/2.13.0/plexus-compiler-javac-2.13.0.jar
Downloaded from central: https://repo.maven.apache.org/maven2/commons-io/commons-io/2.6/commons-io-2.6.jar (215 kB at 5.7 MB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-compiler-manager/2.13.0/plexus-compiler-manager-2.13.0.jar (4.7 kB at 116 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-compiler-api/2.13.0/plexus-compiler-api-2.13.0.jar (27 kB at 643 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-utils/3.5.0/plexus-utils-3.5.0.jar (267 kB at 6.2 MB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-compiler-javac/2.13.0/plexus-compiler-javac-2.13.0.jar (23 kB at 465 kB/s)
[INFO] Changes detected - recompiling the module! :source
[WARNING] File encoding has not been set, using platform encoding UTF-8, i.e. build is platform dependent!
[INFO] Compiling 1 source file with javac [debug target 1.8] to target/classes
[WARNING] bootstrap class path not set in conjunction with -source 8
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 2.521 s
[INFO] Finished at: 2023-12-06T12:01:07+05:30
[INFO] -----
```

Compile will create target folder to place all the application compiled binaries as shown below

```
jegan@tektutor: ~/devops-dec-2023/Day1/hello
jegan@tektutor: ~/devops-dec-2023/Day1/hello
(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
$ tree target
target
└── classes
    └── org
        └── tektutor
            └── Hello.class
└── generated-sources
└── annotations
└── maven-status
    └── maven-compiler-plugin
        └── compile
            └── default-compile
                ├── createdFiles.lst
                └── inputFiles.lst

10 directories, 3 files

(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
$ ls
pom.xml  src  target

(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
$
```

Executing the Hello world application

```
cd ~/devops-dec-2023/Day1/hello
ls
cd target/classes
tree
java org.tektutor.Hello
```

Expected output

```
jegan@tektutor: ~/devops-dec-2023/Day1/hello/target/classes
jegan@tektutor: ~/devops-dec-2023/Day1/hello
(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
$ ls
pom.xml  src  target

(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
$ cd target/classes

(jegan@tektutor.org)-[~/.../Day1/hello/target/classes]
$ tree
.
└── org
    └── tektutor
        └── Hello.class

3 directories, 1 file

(jegan@tektutor.org)-[~/.../Day1/hello/target/classes]
$ java org.tektutor.Hello
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
Hello World!

(jegan@tektutor.org)-[~/.../Day1/hello/target/classes]
$
```

Deleting the target folder

```
cd ~/devops-dec-2023/Day1/hello
tree target
mvn clean
tree target
```

Expected output

The screenshot shows a terminal window with the following session:

```
jegan@tektutor:~/devops-dec-2023/Day1/hello
jegan@tektutor:~/devops-dec-2023
```

```
ls
pom.xml  src  target
```

```
tree target
target
├── classes
│   └── org
│       └── tektutor
│           └── Hello.class
└── generated-sources
    └── annotations
        └── maven-status
            └── maven-compiler-plugin
                └── Compile
                    └── default-compile
                        ├── createdFiles.lst
                        └── inputFiles.lst
```

10 directories, 3 files

```
mvn clean
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO] [INFO] Building hello 1.0.0
[INFO] From pom.xml
[INFO] [jar]
[INFO] [INFO] --- clean:3.2.0:clean (default-clean) @ hello ---
[INFO] Deleting /home/jegan/devops-dec-2023/Day1/hello/target
[INFO] [INFO] BUILD SUCCESS
[INFO] Total time: 0.191 s
[INFO] Finished at: 2023-12-06T12:24:02+05:30
[INFO]
```

```
tree target
target [error opening dir]
0 directories, 0 files
```

```
mvn clean
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO] [INFO] Building hello 1.0.0
[INFO] From pom.xml
[INFO] [jar]
[INFO] [INFO] --- clean:3.2.0:clean (default-clean) @ hello ---
[INFO] Deleting /home/jegan/devops-dec-2023/Day1/hello/target
[INFO] [INFO] BUILD SUCCESS
[INFO] Total time: 0.191 s
[INFO] Finished at: 2023-12-06T12:24:02+05:30
[INFO]
```

```
tree target
target [error opening dir]
0 directories, 0 files
```

```
mvn clean
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO] [INFO] Building hello 1.0.0
[INFO] From pom.xml
[INFO] [jar]
[INFO] [INFO] --- clean:3.2.0:clean (default-clean) @ hello ---
[INFO] Deleting /home/jegan/devops-dec-2023/Day1/hello/target
[INFO] [INFO] BUILD SUCCESS
[INFO] Total time: 0.191 s
[INFO] Finished at: 2023-12-06T12:24:02+05:30
[INFO]
```

Info - What are Maven Plugins?

- Maven Plugins are jar files that are downloaded by Maven build tool on demand from Maven Central Repository website
- Maven Plugins are used by Maven build tool
- For every functionality, Maven build tool depends on specific plugins
- For example:
 - To compile maven project, maven depends on maven-compiler-plugin
 - To delete target folder, maven depends on maven-clean-plugin
 - To package application binaries as jar file, maven depends on maven-jar-plugin
 - To deploy application jar into jfrog artifactory or sonatype nexus, maven depends on maven-deploy-plugin
- Each Maven Plugin has one or more goals
- Each goal supports one functionality
- For example - maven-compiler-plugin supports 3 goals

1. compile
2. testCompile
3. help

Lab - Finding maven-compiler-plugin goals

```
cd ~/devops-dec-2023
git pull
cd Day1/hello
mvn help:describe -Dplugin=org.apache.maven.plugins:maven-compiler-
plugin:3.11.0
```

Expected output

The screenshot shows a terminal window with two tabs. The active tab displays the Maven help output for the compiler plugin. The output includes the plugin's name, description, group ID, artifact ID, version, and goal prefix. It then lists three goals: compile, help, and testCompile, each with a brief description. Finally, it shows a successful build summary with total time and finish date.

```
jegan@tektutor:~/devops-dec-2023/Day1/hello
jegan@tektutor:~/devops-dec-2023/Day1/hello
[jegan@tektutor.org:~/devops-dec-2023/Day1/hello]
$ mvn help:describe -Dplugin=org.apache.maven.plugins:maven-compiler-plugin:3.11.0
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.tektutor:hello >-----
[INFO] Building hello 1.0.0
[INFO]   from pom.xml
[INFO] ----- [ jar ] -----
[INFO]
[INFO] --- help:3.4.0:describe (default-cli) @ hello ---
[INFO] org.apache.maven.plugins:maven-compiler-plugin:3.11.0
Name: Apache Maven Compiler Plugin
Description: The Compiler Plugin is used to compile the sources of your
project.
Group Id: org.apache.maven.plugins
Artifact Id: maven-compiler-plugin
Version: 3.11.0
Goal Prefix: compiler

This plugin has 3 goals:
compiler:compile
  Description: Compiles application sources
compiler:help
  Description: Display help information on maven-compiler-plugin. Call mvn
  compiler:help -Ddetail=true -Dgoal= to display parameter details.
compiler:testCompile
  Description: Compiles application test sources.

For more information, run 'mvn help:describe [...] -Ddetail'

[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time:  0.671 s
[INFO] Finished at: 2023-12-06T12:45:52+05:30
[INFO] -----
```

Info - Maven Life cycle

Life cycle is a combination many Maven Phases, each Maven Phase invokes one or more Maven Plugins, each Plugin has one or more goals.

Maven life-cycle is a sequence of many maven phases executed from top to bottom order. For those phases some plugins are configured, the respective plugin goals will be invoked.

Maven supports 3 types of Life cycle

1. default
2. clean
3. site

Lab - Listing Maven default life-cycle phases

```
cd ~/devops-dec-2023
git pull
cd Day1/hello
mvn help:describe -Dcmd=compile
```

Expected output

The screenshot shows a terminal window with two tabs. The active tab displays the Maven help:describe command output. The output details the lifecycle phases for the 'jar' packaging, listing various stages from validate to deploy. It also shows the build succeeded and the total execution time.

```
jegan@tektutor: ~/devops-dec-2023/Day1/hello
jegan@tektutor: ~/devops-dec-2023/Day1/hello
(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
$ # List all maven default life-cycle phases
(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
$ mvn help:describe -Dcmd=compile
Picked up _JAVA_OPTIONS: -Dawt.useSystemAFontSettings=on -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO]
[INFO] Building hello 1.0.0
[INFO]   from pom.xml
[INFO]   [ jar ]
[INFO]
[INFO] --- help:3.4.0:describe (default-cli) @ hello ---
[INFO] 'compile' is a phase corresponding to this plugin:
org.apache.maven.plugins:maven-compiler-plugin:3.11.0:compile
It is a part of the lifecycle for the POM packaging 'jar'. This lifecycle includes the following phases:
* validate: Not defined
* initialize: Not defined
* generate-sources: Not defined
* process-sources: Not defined
* generate-resources: Not defined
* process-resources: org.apache.maven.plugins:maven-resources-plugin:3.3.1:resources
* compile: org.apache.maven.plugins:maven-compiler-plugin:3.11.0:compile
* process-classes: Not defined
* generate-test-sources: Not defined
* process-test-sources: Not defined
* generate-test-resources: Not defined
* process-test-resources: org.apache.maven.plugins:maven-resources-plugin:3.3.1:testResources
* test-compile: org.apache.maven.plugins:maven-compiler-plugin:3.11.0:testCompile
* process-test-classes: Not defined
* test: org.apache.maven.plugins:maven-surefire-plugin:3.2.2:test
* prepare-package: Not defined
* package: org.apache.maven.plugins:maven-jar-plugin:3.3.0:jar
* pre-integration-test: Not defined
* integration-test: Not defined
* post-integration-test: Not defined
* verify: Not defined
* install: org.apache.maven.plugins:maven-install-plugin:3.1.1:install
* deploy: org.apache.maven.plugins:maven-deploy-plugin:3.1.1:deploy
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 0.431 s
[INFO] Finished at: 2023-12-06T12:54:12+05:30
[INFO] -----
```

Lab - How maven uses the Maven co-ordinates to maintain the plugins and dependencies within maven local repository folder

Maven co-ordinates for maven-compiler-plugin is

```
groupId - org.apache.maven.plugins
artifactId - jar name
version - 3.11.0
```

The above maven co-ordinates of maven-compiler-plugin will be used as a directory structure within maven local repository folder as shown below

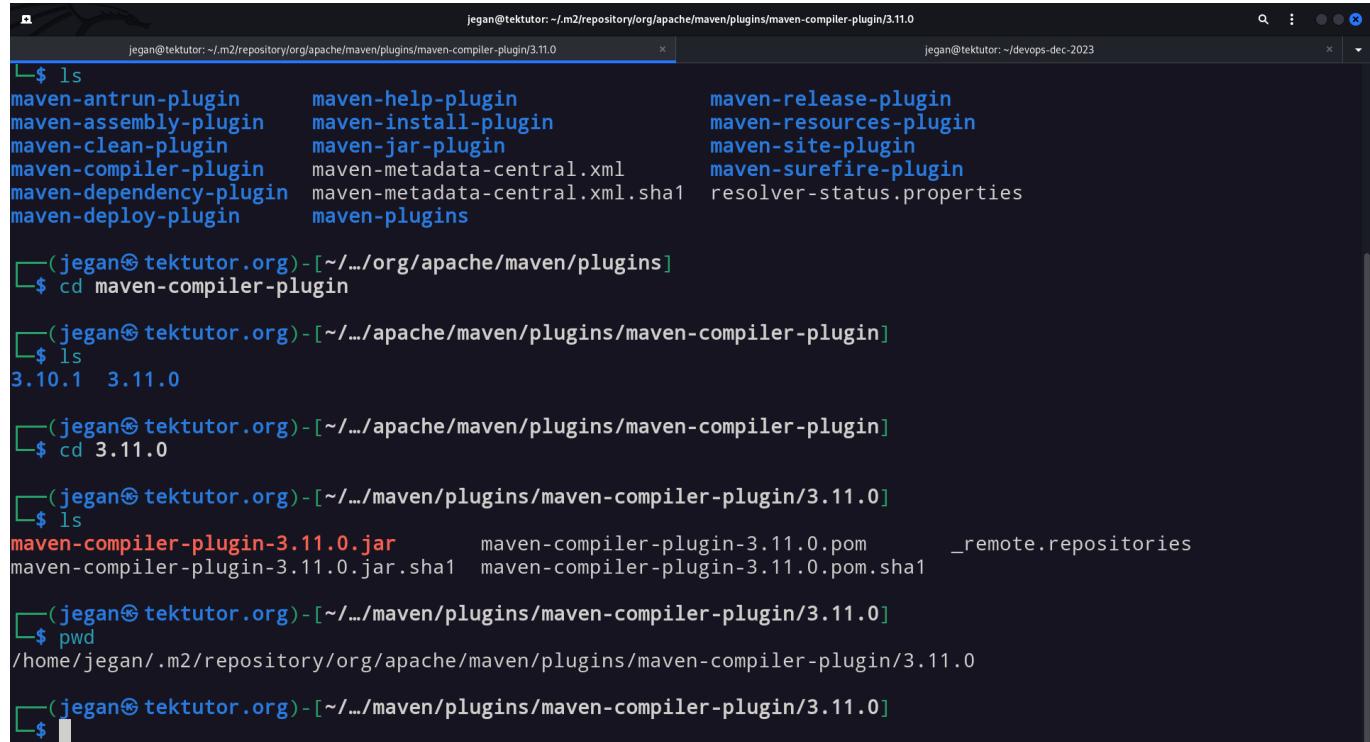
```
cd ~/.m2/repository
# the below folder is formed using groupId
cd org/apache/maven/plugins

## the below folder is formed using artifactId
cd maven-compiler-plugin

# the below folder is formed using version
cd 3.11.0
```

```
# you will be able to locate the maven-compiler-plugin jar and its pom in  
this directory  
ls -l
```

Expected output



The screenshot shows a terminal window with two tabs. The left tab shows the contents of the 'maven-compiler-plugin' directory at version 3.11.0, including various plugin files like maven-help-plugin, maven-install-plugin, etc., and configuration files like maven-metadata-central.xml and resolver-status.properties. The right tab shows the user's home directory (~). The terminal prompt is '\$'.

```
jegan@tektutor: ~/m2/repository/org/apache/maven/plugins/maven-compiler-plugin/3.11.0  
jegan@tektutor: ~/devops-dec-2023  
$ ls  
maven-antrun-plugin      maven-help-plugin          maven-release-plugin  
maven-assembly-plugin    maven-install-plugin     maven-resources-plugin  
maven-clean-plugin       maven-jar-plugin        maven-site-plugin  
maven-compiler-plugin    maven-metadata-central.xml  maven-surefire-plugin  
maven-dependency-plugin   maven-metadata-central.xml.sha1 resolver-status.properties  
maven-deploy-plugin     maven-plugins  
  
└─(jegan@tektutor.org)-[~/.../org/apache/maven/plugins]  
$ cd maven-compiler-plugin  
  
└─(jegan@tektutor.org)-[~/.../apache/maven/plugins/maven-compiler-plugin]  
$ ls  
3.10.1  3.11.0  
  
└─(jegan@tektutor.org)-[~/.../apache/maven/plugins/maven-compiler-plugin]  
$ cd 3.11.0  
  
└─(jegan@tektutor.org)-[~/.../maven/plugins/maven-compiler-plugin/3.11.0]  
$ ls  
maven-compiler-plugin-3.11.0.jar      maven-compiler-plugin-3.11.0.pom      _remote.repositories  
maven-compiler-plugin-3.11.0.jar.sha1  maven-compiler-plugin-3.11.0.pom.sha1  
  
└─(jegan@tektutor.org)-[~/.../maven/plugins/maven-compiler-plugin/3.11.0]  
$ pwd  
/home/jegan/.m2/repository/org/apache/maven/plugins/maven-compiler-plugin/3.11.0  
  
└─(jegan@tektutor.org)-[~/.../maven/plugins/maven-compiler-plugin/3.11.0]  
$
```

Lab - Listing the clean life-cycle phases

```
cd ~/devops-dec-2023  
git pull  
cd Day1/hello  
mvn help:describe -Dcmd=clean
```

Expected output

```
jegan@tektutor: ~/m2/repository/org/apache/maven/plugins/maven-compiler-plugin/3.11.0
jegan@tektutor: ~/m2/repository/org/apache/maven/plugins/maven-compiler-plugin/3.11.0
(jegan@tektutor.org)-[~/m2/repository/org/apache/maven/plugins/maven-compiler-plugin/3.11.0]
$ set -o vi

(jegan@tektutor.org)-[~/m2/repository/org/apache/maven/plugins/maven-compiler-plugin/3.11.0]
$ mvn help:describe -Dcmd=clean
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=true -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.apache.maven:standalone-pom >-----
[INFO] Building Maven Stub Project (No POM) 1
[INFO] -----[ pom ]-----
[INFO]
[INFO] --- help:3.4.0:describe (default-cli) @ standalone-pom ---
[INFO] 'clean' is a phase within the 'clean' lifecycle, which has the following phases:
* pre-clean: Not defined
* clean: org.apache.maven.plugins:maven-clean-plugin:3.2.0:clean
* post-clean: Not defined

[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time:  0.378 s
[INFO] Finished at: 2023-12-06T14:01:33+05:30
[INFO] -----
```

The terminal window shows the Maven command `mvn help:describe -Dcmd=clean` being run. The output displays the Maven lifecycle for the `clean` phase, which includes the `pre-clean`, `clean`, and `post-clean` phases. It also shows the total build time and completion date.

Lab - Listing the site life-cycle phases

```
cd ~/devops-dec-2023
git pull
cd Day1/hello
mvn help:describe -Dcmd=site
```

Expected output

```
jegan@tektutor: ~/devops-dec-2023/Day1/hello
jegan@tektutor: ~/devops-dec-2023/Day1/hello
(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
$ mvn help:describe -Dcmd=site
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=true -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.tektutor:hello >-----
[INFO] Building hello 1.0.0
[INFO]   from pom.xml
[INFO] -----[ jar ]-----
[INFO]
[INFO] --- help:3.4.0:describe (default-cli) @ hello ---
[INFO] 'site' is a phase within the 'site' lifecycle, which has the following phases:
* pre-site: Not defined
* site: org.apache.maven.plugins:maven-site-plugin:3.12.1:site
* post-site: Not defined
* site-deploy: org.apache.maven.plugins:maven-site-plugin:3.12.1:deploy

[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time:  0.419 s
[INFO] Finished at: 2023-12-06T14:05:35+05:30
[INFO] -----
```

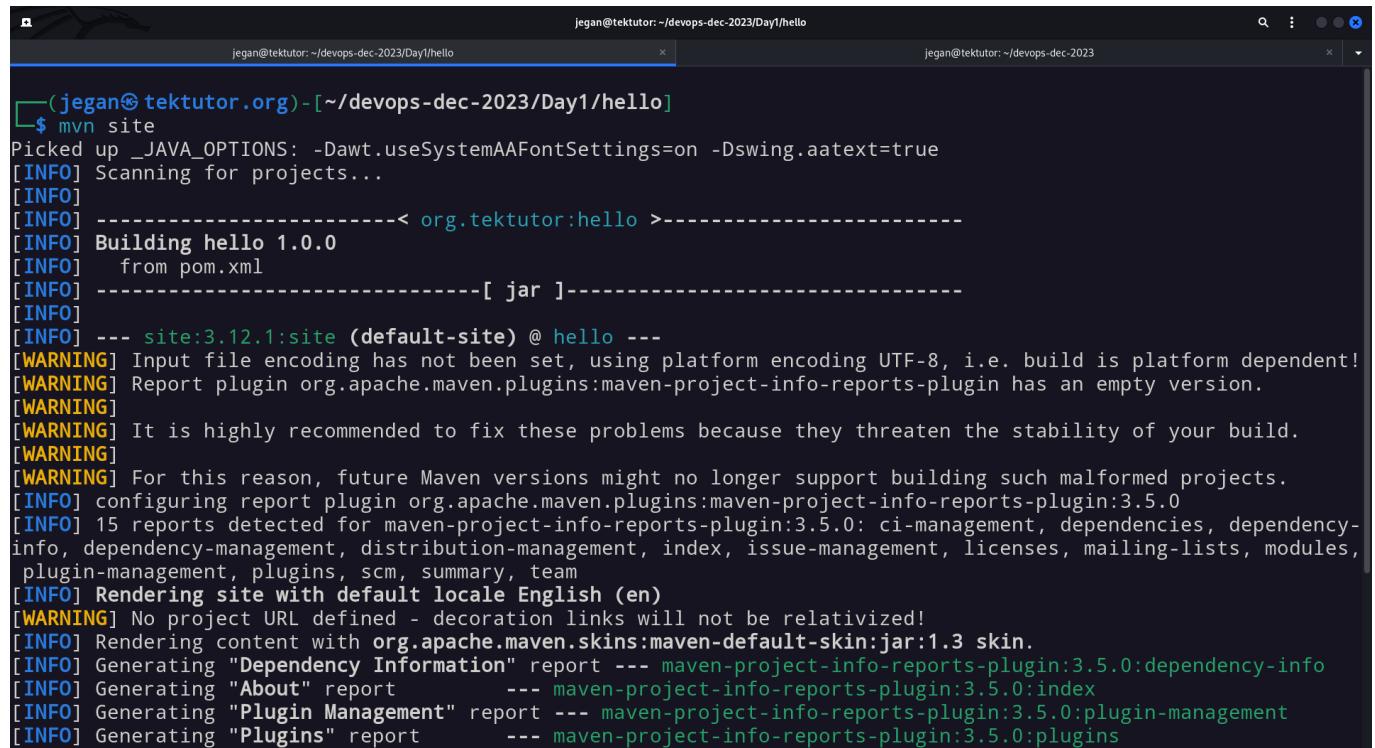
The terminal window shows the Maven command `mvn help:describe -Dcmd=site` being run. The output displays the Maven lifecycle for the `site` phase, which includes the `pre-site`, `site`, `post-site`, and `site-deploy` phases. It also shows the total build time and completion date.

Lab - Understanding the use of mvn site command

```
cd ~/devops-dec-2023  
git pull  
cd Day1/hello  
mvn site
```

The above maven command will generate html documentation based on the pom.xml. This documentation web pages can be accessed using web browsers by the team members to understanding the plugins and dependent libraries.

Expected output



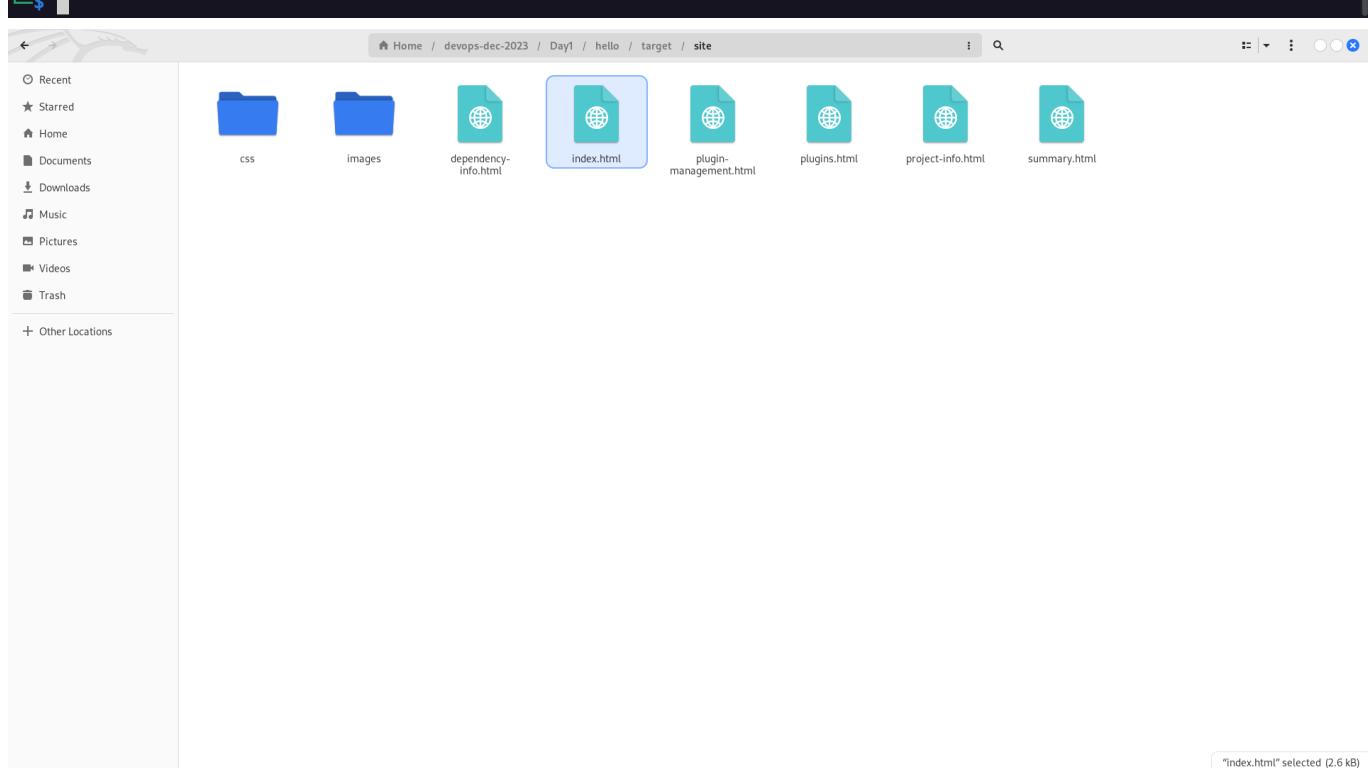
A screenshot of a terminal window titled "jegan@tektutor: ~/devops-dec-2023/Day1/hello". The terminal shows the command \$ mvn site being run, followed by a series of Maven logs. The logs indicate the project is building, scanning for projects, and generating site reports. It also includes several warning messages about Java options, project encoding, and missing plugin versions.

```
(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]  
$ mvn site  
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true  
[INFO] Scanning for projects...  
[INFO] [INFO] -----< org.tektutor:hello >-----  
[INFO] Building hello 1.0.0  
[INFO]   from pom.xml  
[INFO] -----[ jar ]-----  
[INFO] --- site:3.12.1:site (default-site) @ hello ---  
[WARNING] Input file encoding has not been set, using platform encoding UTF-8, i.e. build is platform dependent!  
[WARNING] Report plugin org.apache.maven.plugins:maven-project-info-reports-plugin has an empty version.  
[WARNING]  
[WARNING] It is highly recommended to fix these problems because they threaten the stability of your build.  
[WARNING]  
[WARNING] For this reason, future Maven versions might no longer support building such malformed projects.  
[INFO] configuring report plugin org.apache.maven.plugins:maven-project-info-reports-plugin:3.5.0  
[INFO] 15 reports detected for maven-project-info-reports-plugin:3.5.0: ci-management, dependencies, dependency-info, dependency-management, distribution-management, index, issue-management, licenses, mailing-lists, modules, plugin-management, plugins, scm, summary, team  
[INFO] Rendering site with default locale English (en)  
[WARNING] No project URL defined - decoration links will not be relativized!  
[INFO] Rendering content with org.apache.maven.skins:maven-default-skin:jar:1.3 skin.  
[INFO] Generating "Dependency Information" report --- maven-project-info-reports-plugin:3.5.0:dependency-info  
[INFO] Generating "About" report      --- maven-project-info-reports-plugin:3.5.0:index  
[INFO] Generating "Plugin Management" report --- maven-project-info-reports-plugin:3.5.0:plugin-management  
[INFO] Generating "Plugins" report    --- maven-project-info-reports-plugin:3.5.0:plugins
```

```
jegan@tektutor: ~/devops-dec-2023/Day1/hello
jegan@tektutor: ~/devops-dec-2023

[INFO]
[INFO] --- site:3.12.1:site (default-site) @ hello ---
[WARNING] Input file encoding has not been set, using platform encoding UTF-8, i.e. build is platform dependent!
[WARNING] Report plugin org.apache.maven.plugins:maven-project-info-reports-plugin has an empty version.
[WARNING]
[WARNING] It is highly recommended to fix these problems because they threaten the stability of your build.
[WARNING]
[WARNING] For this reason, future Maven versions might no longer support building such malformed projects.
[INFO] configuring report plugin org.apache.maven.plugins:maven-project-info-reports-plugin:3.5.0
[INFO] 15 reports detected for maven-project-info-reports-plugin:3.5.0: ci-management, dependencies, dependency-info, dependency-management, distribution-management, index, issue-management, licenses, mailing-lists, modules, plugin-management, plugins, scm, summary, team
[INFO] Rendering site with default locale English (en)
[WARNING] No project URL defined - decoration links will not be relativized!
[INFO] Rendering content with org.apache.maven.skins:maven-default-skin:jar:1.3 skin.
[INFO] Generating "Dependency Information" report --- maven-project-info-reports-plugin:3.5.0:dependency-info
[INFO] Generating "About" report     --- maven-project-info-reports-plugin:3.5.0:index
[INFO] Generating "Plugin Management" report --- maven-project-info-reports-plugin:3.5.0:plugin-management
[INFO] Generating "Plugins" report    --- maven-project-info-reports-plugin:3.5.0:plugins
[INFO] Generating "Summary" report    --- maven-project-info-reports-plugin:3.5.0:summary
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time:  1.566 s
[INFO] Finished at: 2023-12-06T14:07:55+05:30
[INFO] -----
```

(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]



Last Published: 2023-12-06 | Version: 1.0.0

About hello

There is currently no description associated with this project.

Built by Maven

Copyright © 2023..

Lab - Integrating JUnit automated test cases as part of maven build

```
cd ~/devops-dec-2023
git pull
cd Day1/hello
cat pom.xml
```

Expected output

```
jegan@tektutor: ~/devops-dec-2023/Day1/hello
[java] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0
[java]
[java] -----
[java] BUILD SUCCESS
[java] -----
[java] Total time: 0.889 s
[java] Finished at: 2023-12-06T14:44:24+05:30
[java] -----
```

```
(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
$ cat pom.xml
<project>
    <modelVersion>4.0.0</modelVersion>

    <groupId>org.tektutor</groupId>
    <artifactId>hello</artifactId>
    <version>1.0.0</version>

    <dependencies>
        <dependency>
            <groupId>junit</groupId>
            <artifactId>junit</artifactId>
            <version>4.12</version>
        </dependency>
    </dependencies>
</project>
```

In the above screenshot, you can notice we added junit dependency so that Maven will download the junit testing framework jar file from Maven Central repository and cache in the Maven local repository.

Also notice, we added JUnit test case as shown below

```
cd ~/devops-dec-2023
git pull
cd Day1/hello
cat src/test/org/tektutor/HelloTest.java
```

Expected output

The screenshot shows a terminal window with two tabs. The left tab displays Maven dependency XML output, and the right tab shows the HelloTest.java code. The code defines a test method `testSayHello` that asserts the string "Hello World!".

```
jegan@tektutor:~/devops-dec-2023/Day1/hello
<groupId>junit</groupId>
<artifactId>junit</artifactId>
<version>4.12</version>
</dependency>
</dependencies>
</project>

(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
$ cat src/test/java/org/tektutor/HelloTest.java
package org.tektutor;

import org.junit.Test;
import static org.junit.Assert.*;

public class HelloTest {

    @Test
    public void testSayHello() {
        Hello hello = new Hello();

        String actualResponse = hello.sayHello();
        String expectedResponse = "Hello World!";

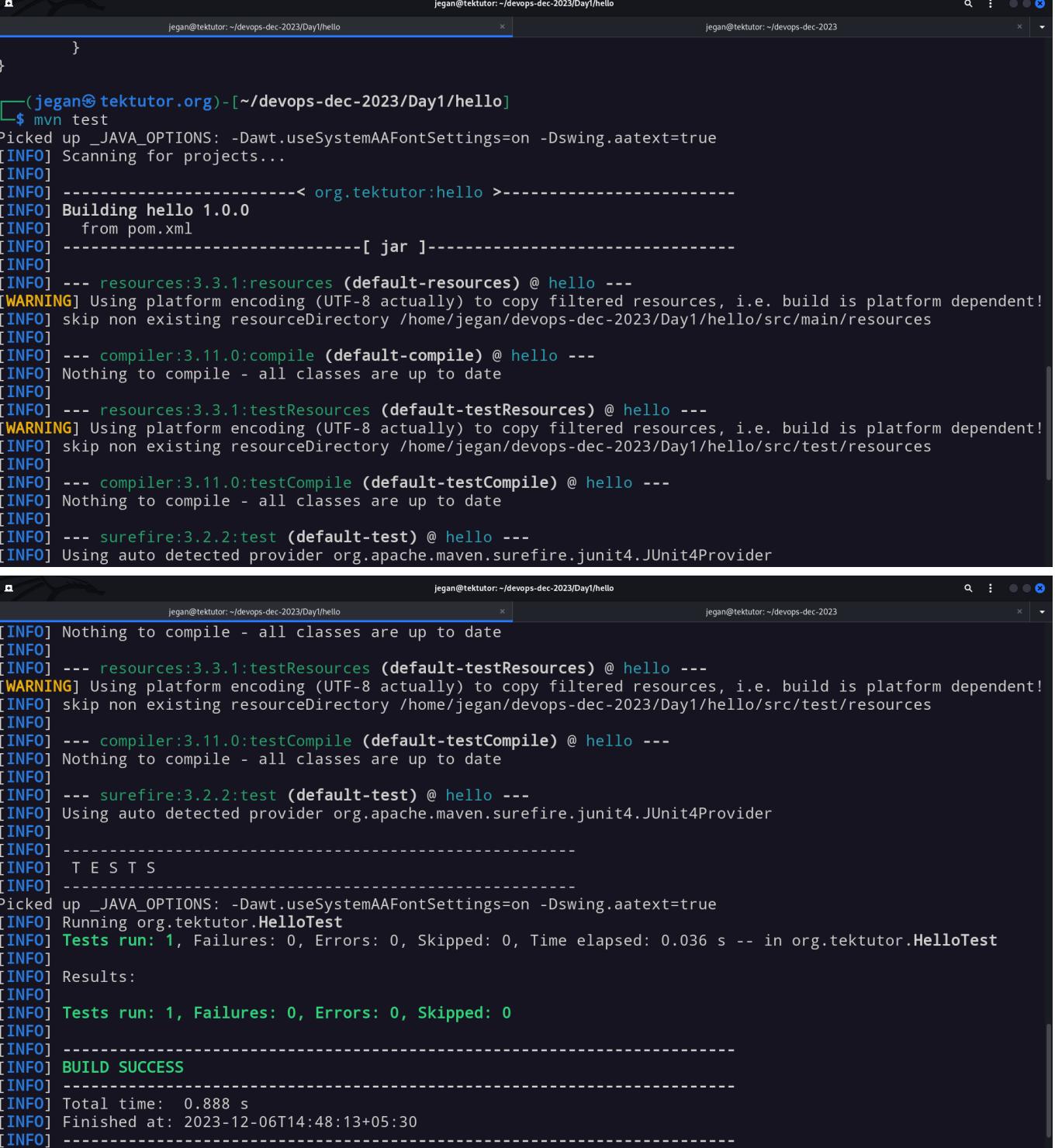
        assertEquals ( expectedResponse, actualResponse );
    }
}

(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
$
```

We can now compile and execute the test cases as part of Maven build with the below commands

```
cd ~/devops-dec-2023
git pull
cd Day1/hello
mvn test
```

Expected output



```
jegan@tektutor: ~/devops-dec-2023/Day1/hello
$ mvn test
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.tektutor:hello >-----
[INFO] Building hello 1.0.0
[INFO]   from pom.xml
[INFO] -----[ jar ]-----
[INFO]
[INFO] --- resources:3.3.1:resources (default-resources) @ hello ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory /home/jegan/devops-dec-2023/Day1/hello/src/main/resources
[INFO]
[INFO] --- compiler:3.11.0:compile (default-compile) @ hello ---
[INFO] Nothing to compile - all classes are up to date
[INFO]
[INFO] --- resources:3.3.1:testResources (default-testResources) @ hello ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory /home/jegan/devops-dec-2023/Day1/hello/src/test/resources
[INFO]
[INFO] --- compiler:3.11.0:testCompile (default-testCompile) @ hello ---
[INFO] Nothing to compile - all classes are up to date
[INFO]
[INFO] --- surefire:3.2.2:test (default-test) @ hello ---
[INFO] Using auto detected provider org.apache.maven.surefire.junit4.JUnit4Provider
jegan@tektutor: ~/devops-dec-2023/Day1/hello
jegan@tektutor: ~/devops-dec-2023
[INFO] Nothing to compile - all classes are up to date
[INFO]
[INFO] --- resources:3.3.1:testResources (default-testResources) @ hello ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory /home/jegan/devops-dec-2023/Day1/hello/src/test/resources
[INFO]
[INFO] --- compiler:3.11.0:testCompile (default-testCompile) @ hello ---
[INFO] Nothing to compile - all classes are up to date
[INFO]
[INFO] --- surefire:3.2.2:test (default-test) @ hello ---
[INFO] Using auto detected provider org.apache.maven.surefire.junit4.JUnit4Provider
[INFO]
[INFO] -----
[INFO] T E S T S
[INFO] -----
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Running org.tektutor.HelloTest
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.036 s -- in org.tektutor.HelloTest
[INFO]
[INFO] Results:
[INFO]
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0
[INFO]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 0.888 s
[INFO] Finished at: 2023-12-06T14:48:13+05:30
[INFO] -----
```

In the above screenshot, you can notice the maven build executed one test case as part of the build. In case any one of the testcases or multiple test cases fail, the build will also fail. The build will succeed, only if all the test cases passes.

Lab - Launching JFrog Artifactory server as a Docker container

```
cd ~
docker run -d --name jfrog --hostname jfrog -p 8081-8082:8081-8082
releases-docker.jfrog.io/jfrog/artifactory-oss:latest
docker ps
```

Expected output

```
jegan@tektutor:~/devops-dec-2023/Day1/hello
jegan@tektutor:~/devops-dec-2023/Day1/hello
[jegan@tektutor.org]-(~/devops-dec-2023/Day1/hello)
$ # Launching JFrog Artifactory as a Docker container
[jegan@tektutor.org]-(~/devops-dec-2023/Day1/hello]
$ docker run -d --name jfrog --hostname jfrog -p 8081-8082:8081-8082 releases-docker.jfrog.io/jfrog/artifactory-oss:latest
Unable to find image 'releases-docker.jfrog.io/jfrog/artifactory-oss:latest' locally
latest: Pulling from jfrog/artifactory-oss
baff9e5cc126: Pull complete
1f692817f8ff: Pull complete
f9695e71bf47: Pull complete
1d2e31042e4f: Pull complete
edd7c67a3ae0: Pull complete
4f4fb700ef54: Pull complete
68ab6e126c8e: Pull complete
00a5596c9c8e: Pull complete
a377c5d0252d: Pull complete
27e5b90f6973: Pull complete
Digest: sha256:469a93c8bbaca7250292c6b1996e9f5d8f9ff57d8a42ae24d1527f39d7404565
Status: Downloaded newer image for releases-docker.jfrog.io/jfrog/artifactory-oss:latest
c7fe1568fc796c65ed026239f8e1b84b96513e16d458dfe11e4d7b18dd825e9f

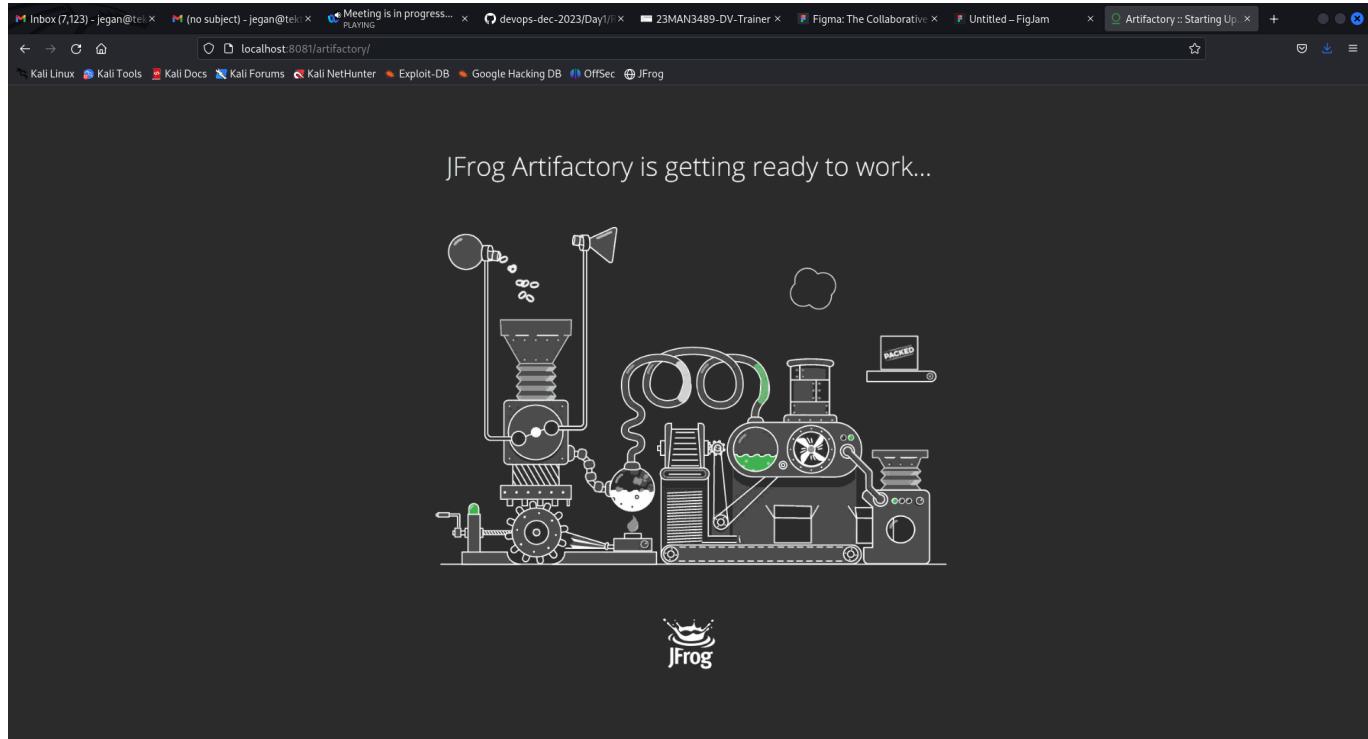
[jegan@tektutor.org]-(~/devops-dec-2023/Day1/hello]
$ docker ps
CONTAINER ID IMAGE NAMES COMMAND CREATED STATUS PORTS
c7fe1568fc79 releases-docker.jfrog.io/jfrog/artifactory-oss:latest "/entrypoint-artifac..." 5 seconds ago Up 3 seconds 0.0.0.0:8081-8082->8081-8082/tcp, :::8081-8082->8081-8082/tcp jfrog

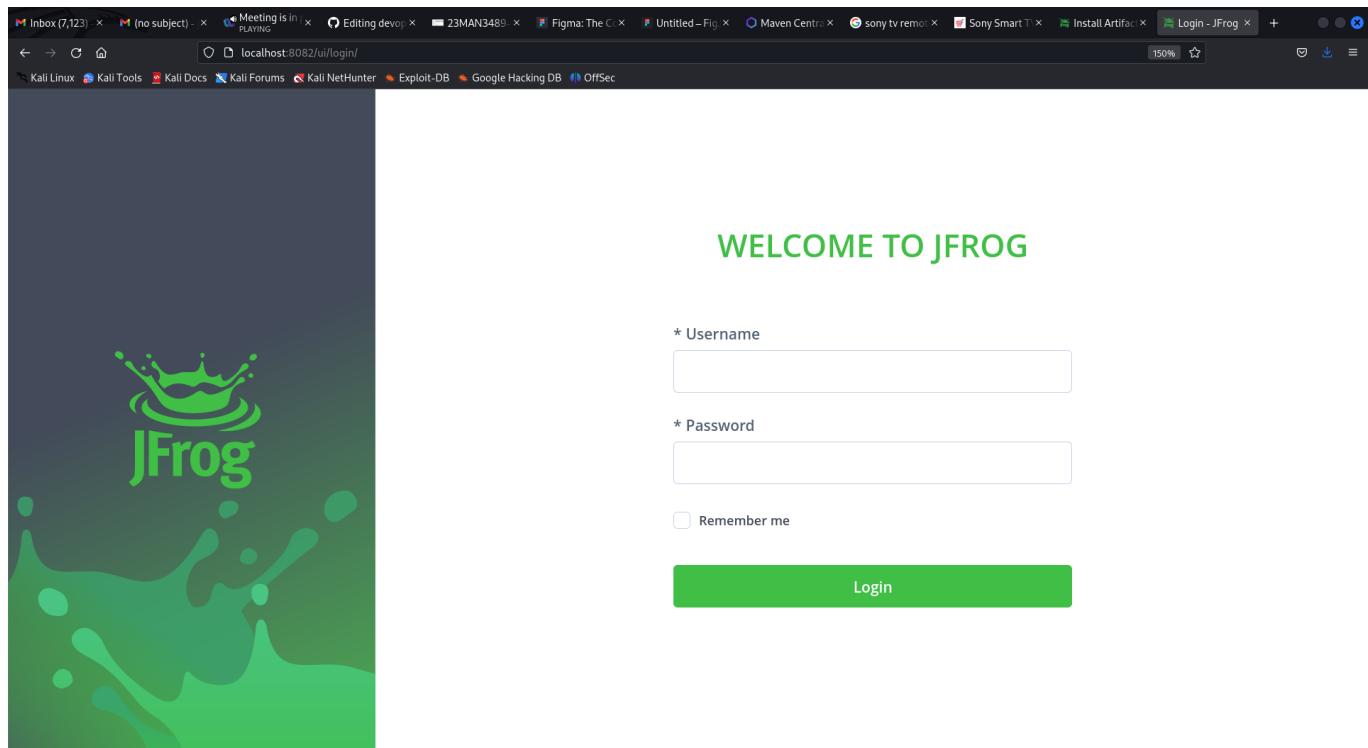
[jegan@tektutor.org]-(~/devops-dec-2023/Day1/hello]
$
```

Accessing the JFrog Artifactory from your RPS CentOS machine Web browser

```
http://localhost:8081
```

Expected output

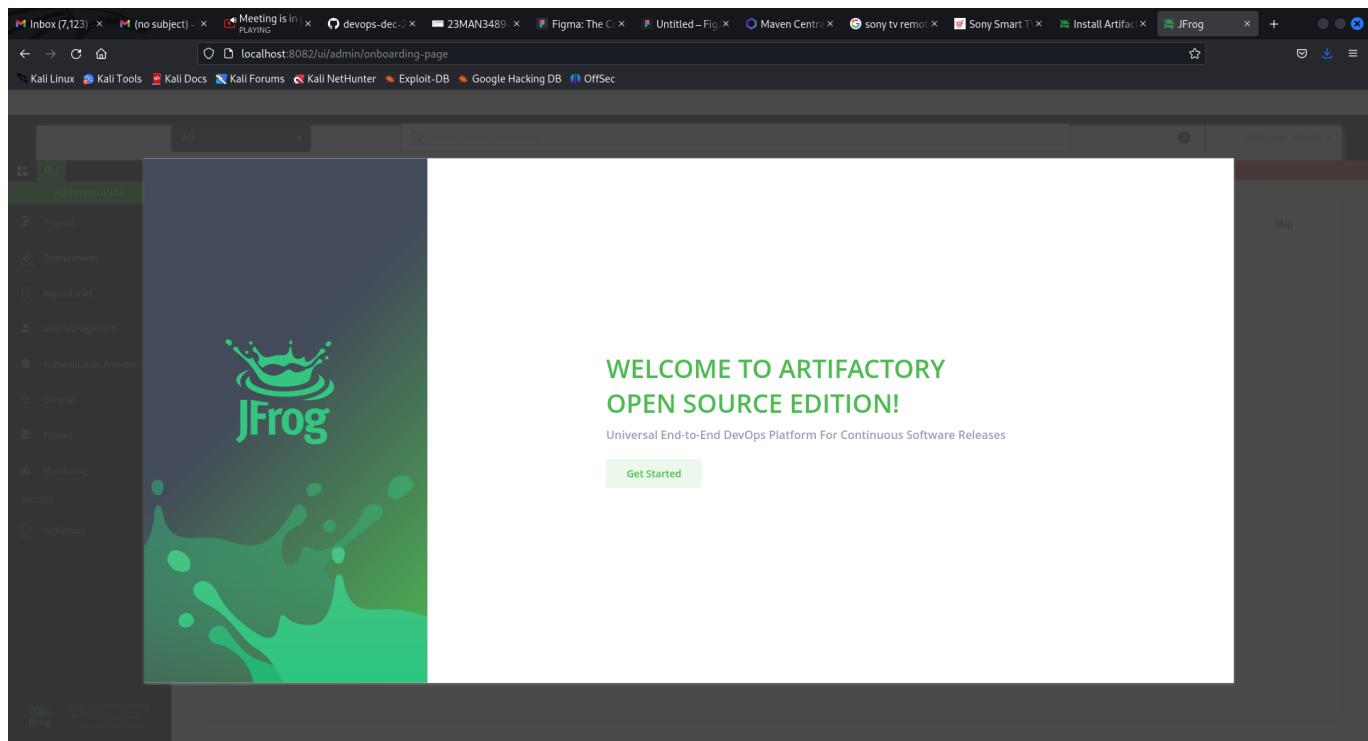




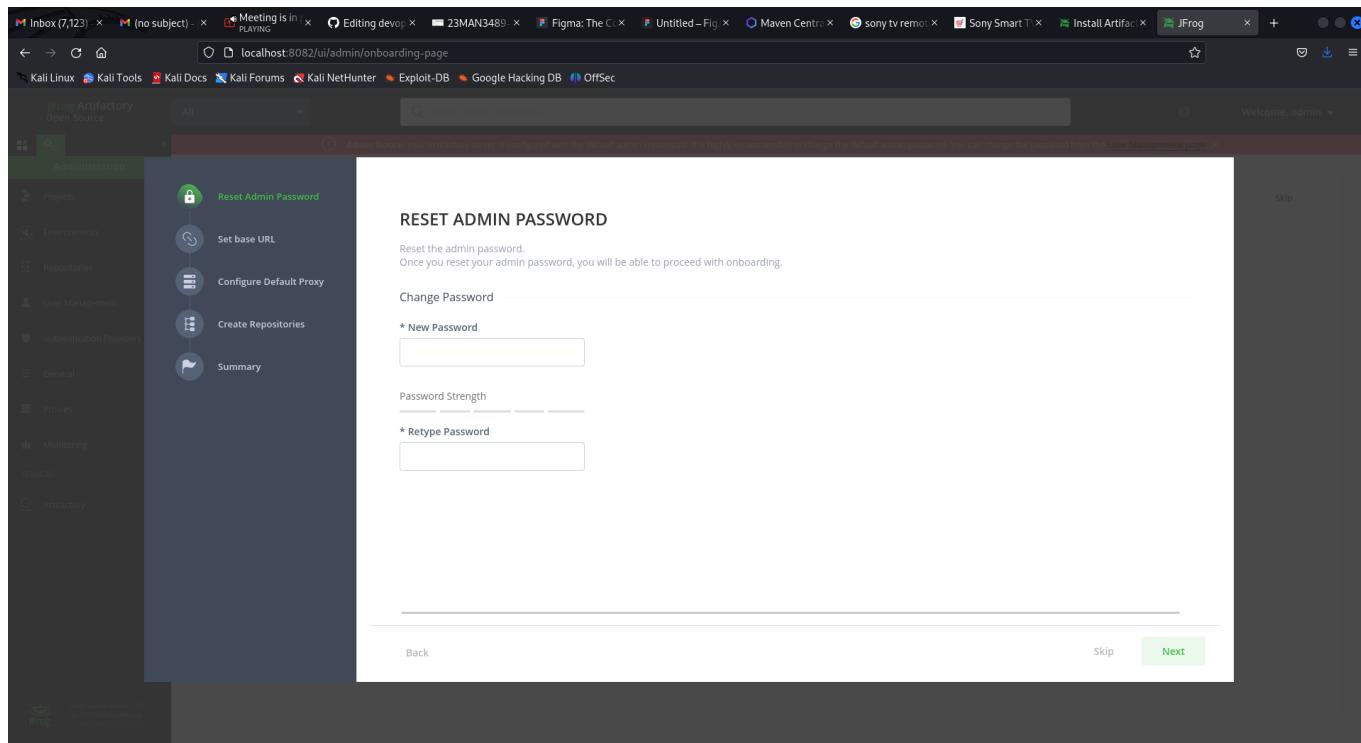
The default JFrog Artifactory server login credentials are

```
username - admin  
password - password
```

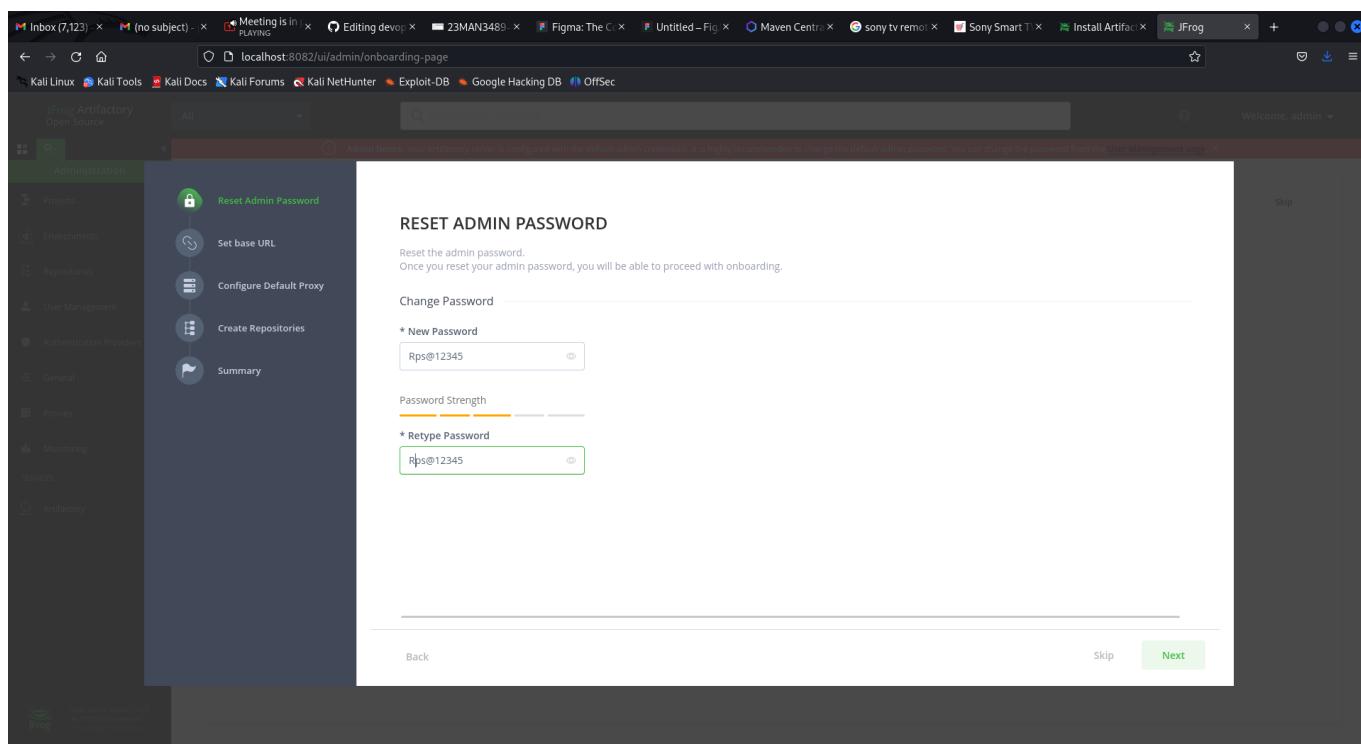
When it prompts for changing the password, change it Rps@12345



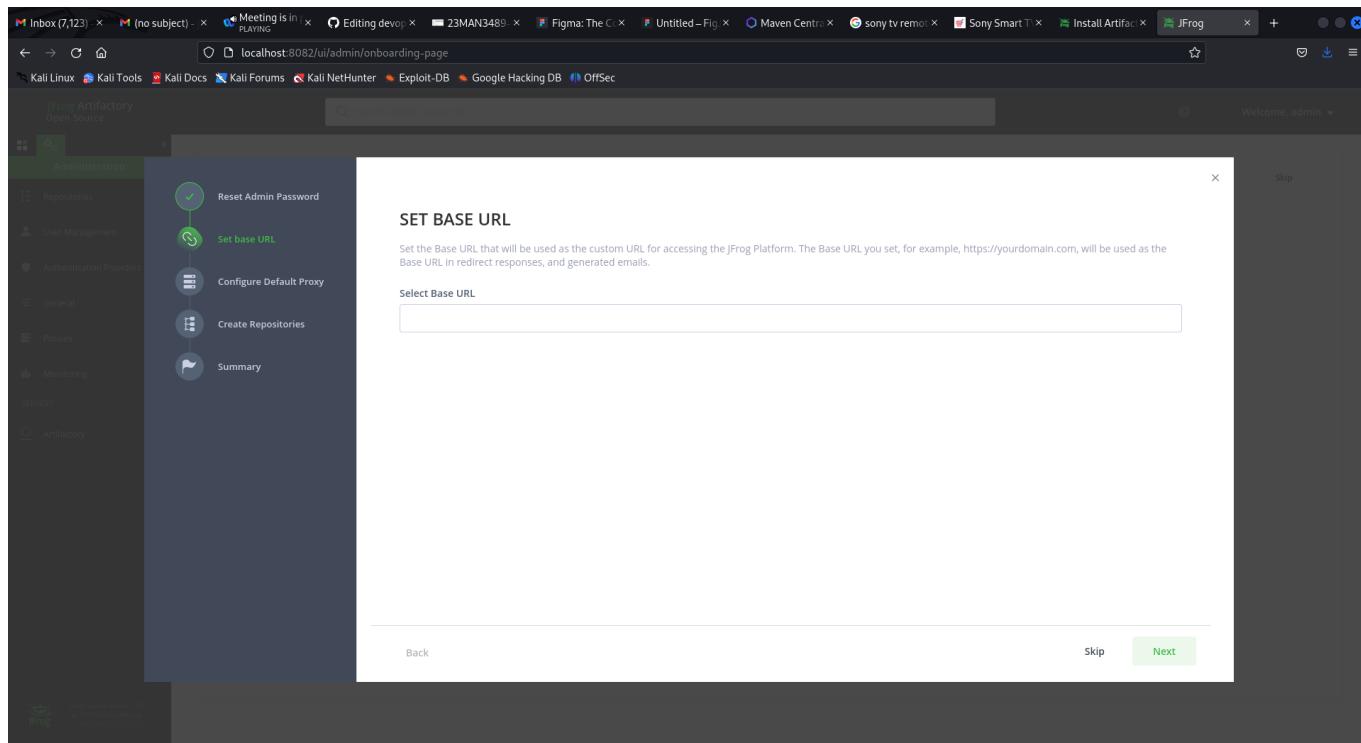
Click on "Get Started" button



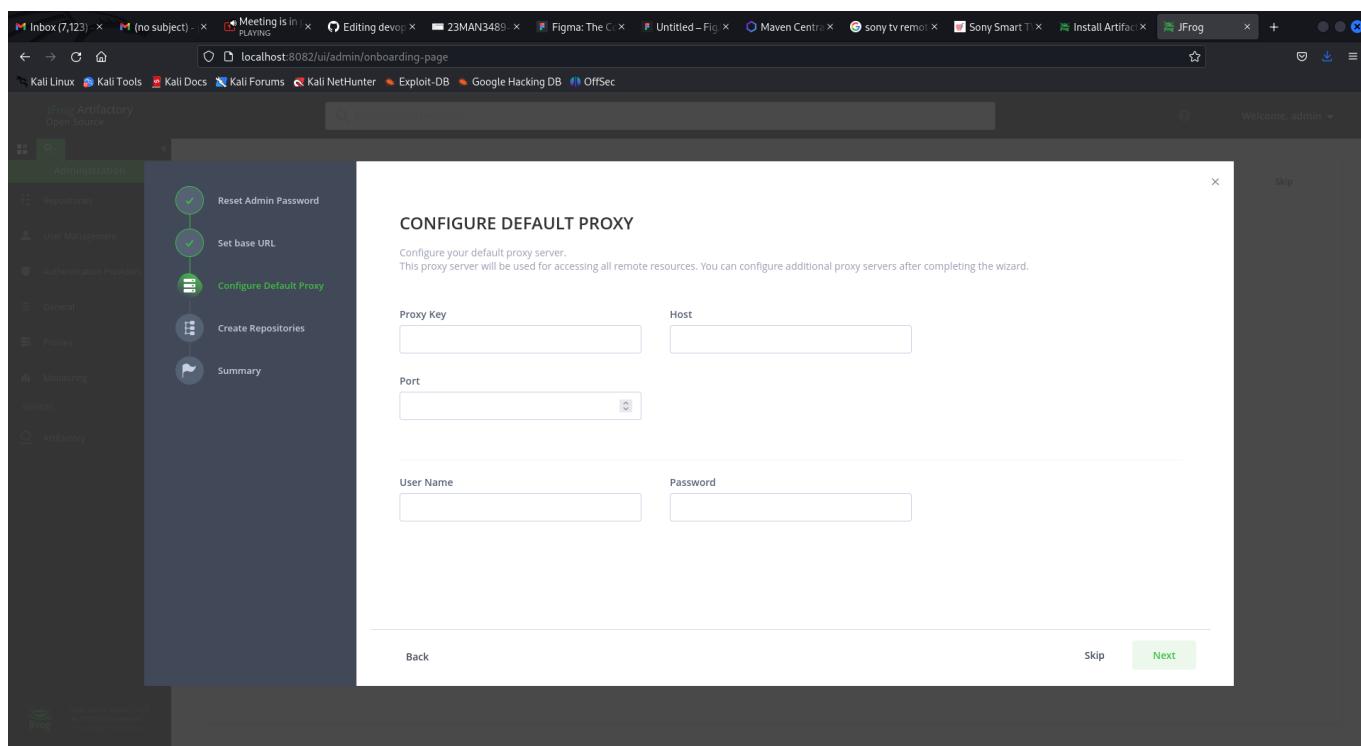
Reset the password to Rps@12345



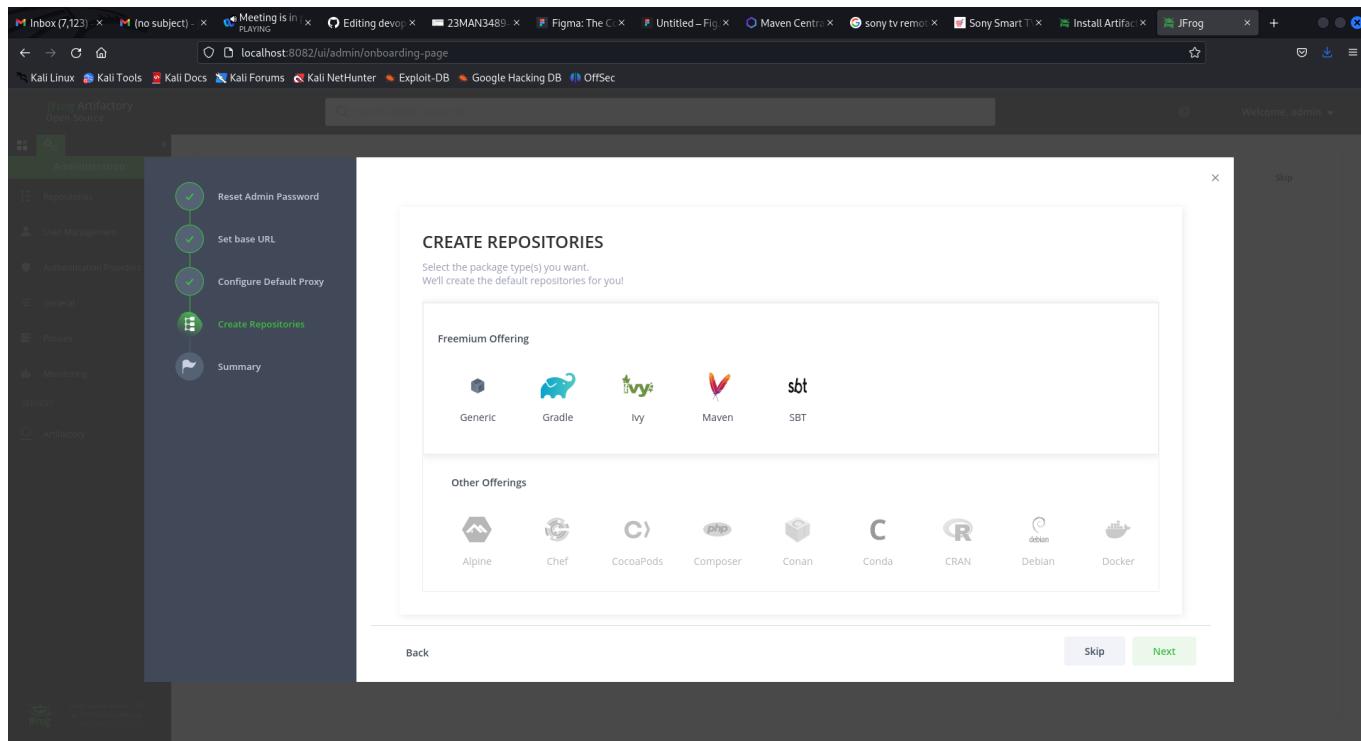
Click on "Next" button



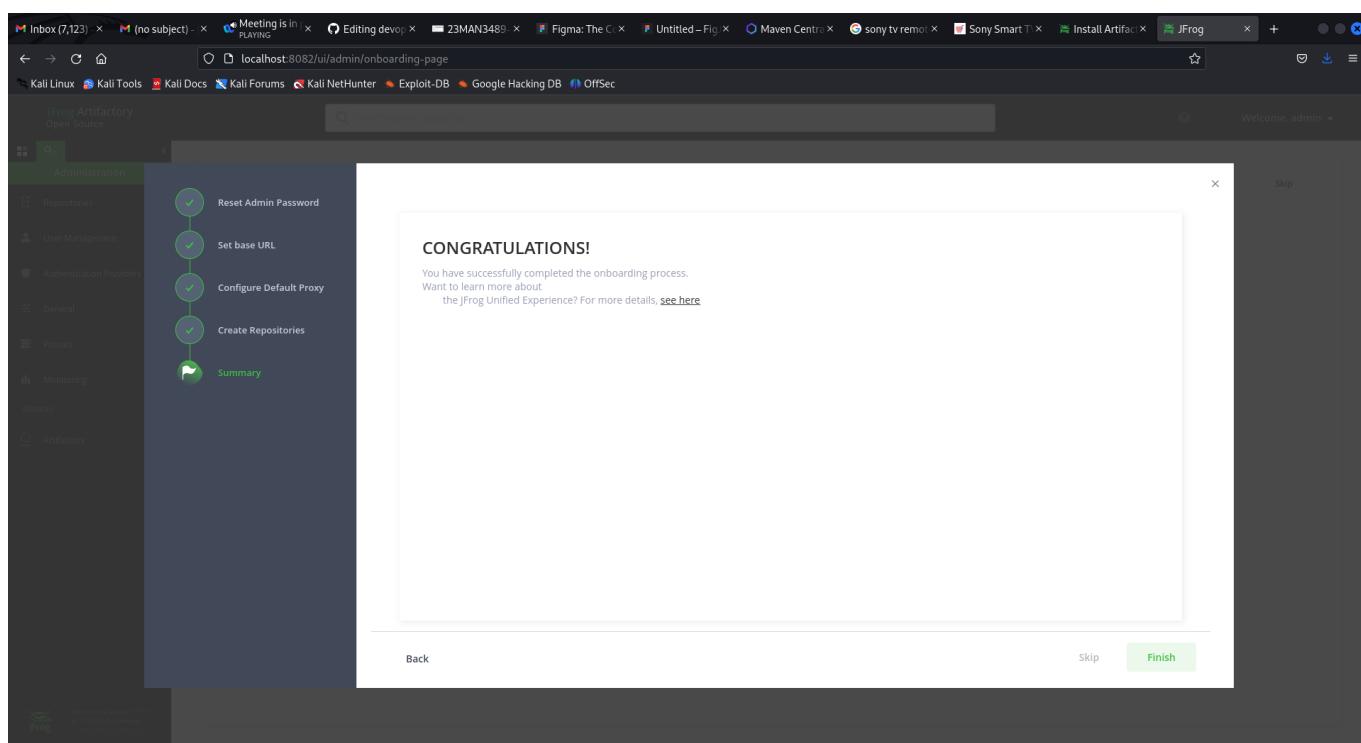
Click on "Skip" button



Click on "Skip" button



Click on "Skip" button



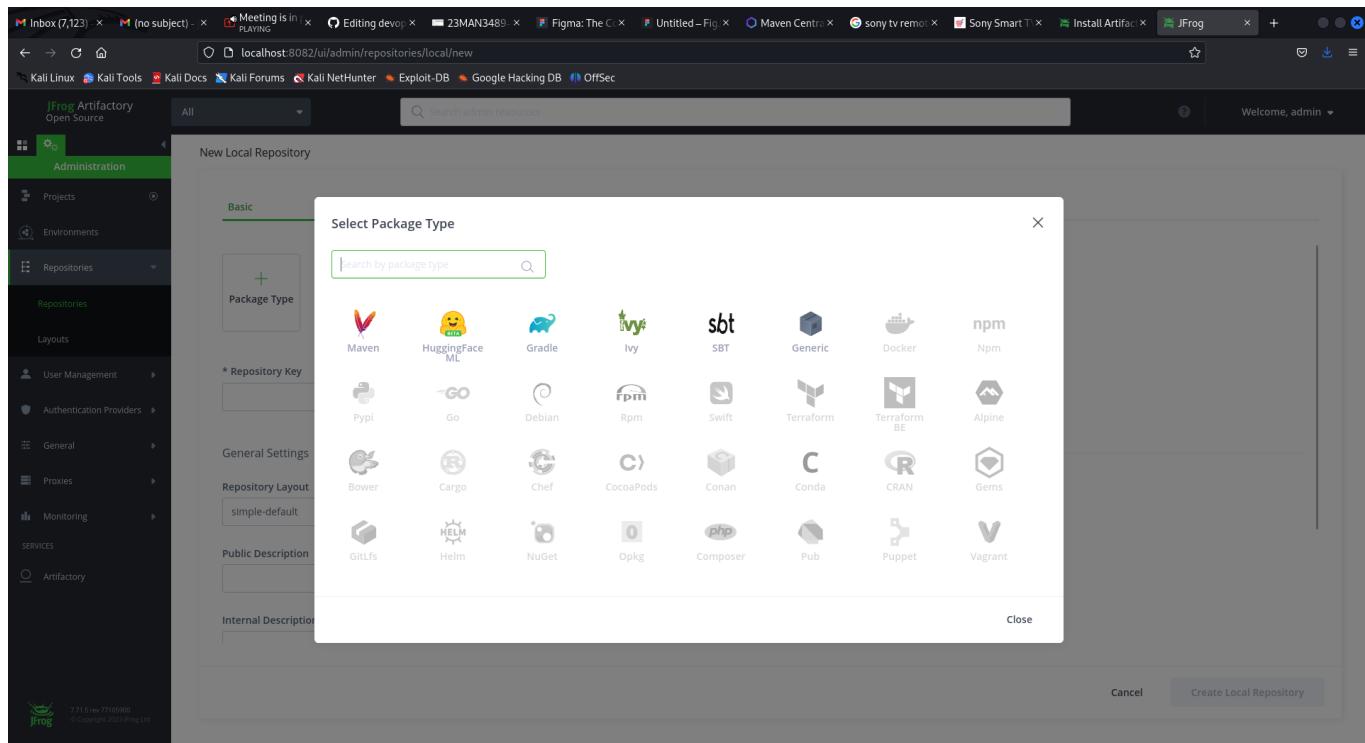
Click on "Finish" button

The screenshot shows the JFrog Platform's onboarding page. The left sidebar is titled "Administration" and includes sections for Projects, Environments, Repositories, User Management, Authentication Providers, General, Proxies, and Monitoring. The main content area features a green header "Welcome To JFrog Platform" and a sub-header "Universal End-to-End DevOps Platform For Continuous Software Releases". Below this is a graphic of three 3D cubes. A call-to-action button labeled "Create a Repository" is prominently displayed.

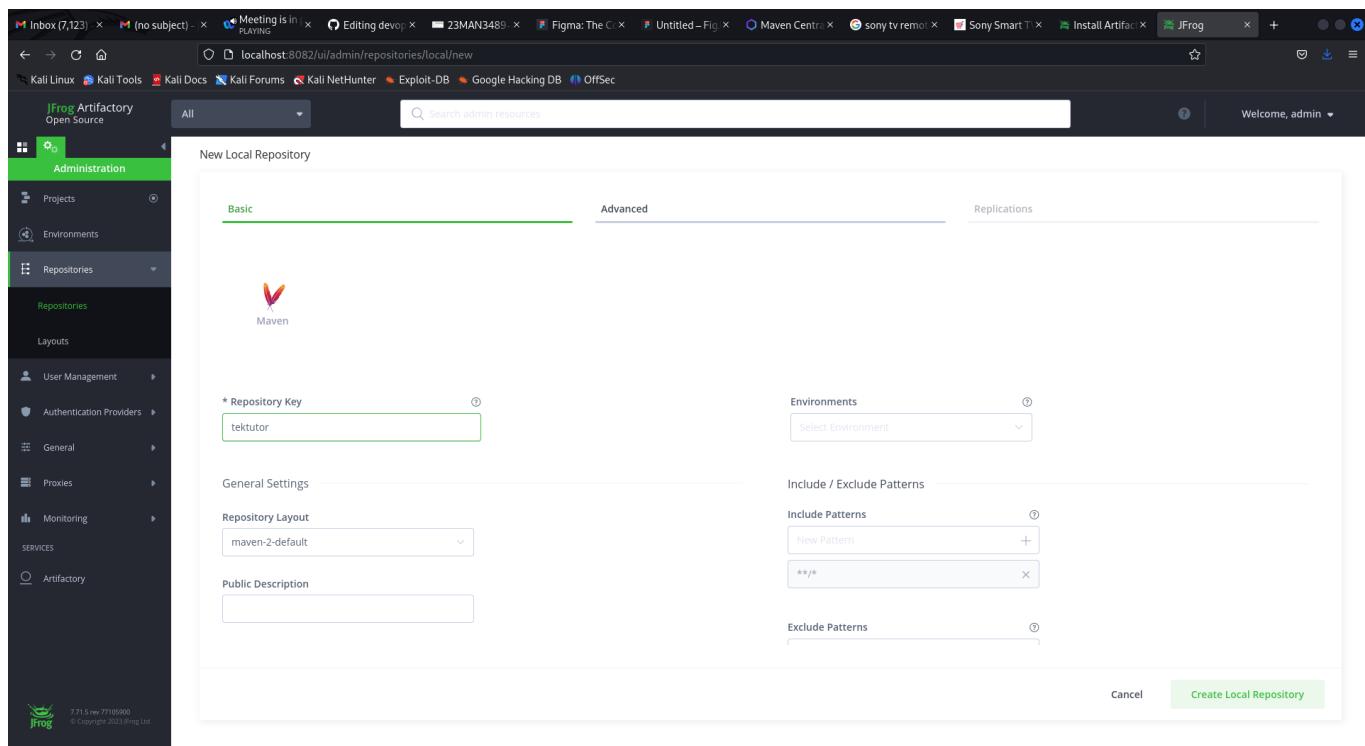
Click on "Create a repository" button

The screenshot shows the "Repositories" section of the JFrog Platform. The left sidebar remains the same as the previous screen. The main content area displays a table titled "Repositories" with one entry: "example-repo-local" of type "Generic". There are tabs for "Local", "Remote", and "Virtual". A "Search" bar and a "Add Repositories" button are also visible.

Click on "Add Repository" and then select "Local Respository"



Select "Maven"



type "tektutor" in the Repository key and click on "Create Local Respository" button

The screenshot shows the JFrog Artifactory Open Source administration interface. On the left, a sidebar lists various management sections like Projects, Environments, and Repositories. The main area is titled 'Repositories' and shows two local repositories: 'example-repo-local' (Generic type) and 'tekutor' (Maven type). A central modal window is open, displaying a success message: 'All repositories were created successfully'. It includes a small 3D bar chart graphic and a green 'Add Users' button. Below the modal, the main repository list is visible.

You may close the window without creating users.

This screenshot shows the same JFrog Artifactory interface after the repositories have been created. The repository list now displays both 'example-repo-local' and 'tekutor' entries, each with its respective type (Generic and Maven) and other details like Project, Environment, Replications, and Shared With.

On the top Left, switch from "Administration" tab to "Application" tab

The screenshot shows the JFrog Artifactory application interface. On the left, there is a sidebar with various navigation options: Dashboard, Artifactory (selected), Packages, Builds, Artifacts (selected), Xray, Distribution, Pipelines, and Integrations. At the bottom of the sidebar, it says "7.71.5 rev 77105900 © Copyright 2023 JFrog Ltd". The main content area is titled "Repositories" and shows two local repositories: "example-repo-local" (Generic type) and "tektutor" (Maven type). There are tabs for Local, Remote, and Virtual. A search bar at the top right says "Search Packages". The bottom of the page shows "Showing 1 - 2 from 2 items" and a page number indicator [1] >.

On the top left, click on "Artifactory" and "Artifacts" under that

The screenshot shows the JFrog Artifactory artifacts interface. The sidebar on the left is identical to the previous screenshot. The main content area shows a list of artifacts under the repository "tektutor". One artifact is selected: "tektutor". The details for this artifact are shown in a large panel on the right. The artifact has the following properties:

- Name: tektutor
- Package Type: Maven
- Repository Path: tektutor/
- URL to file: http://localhost:8082/artifactory/tektutor/
- Repository Layout: maven-2-default
- Description: (empty)
- Artifact Count / Size: Show
- Created: 06-12-23 09:57:12 +00:00

Below the artifact details, there are sections for "Package Information" and "Dependency Declaration". At the bottom left, there is a "Trash Can" button.

The url shown below is the URL we could use to deploy our application artifacts

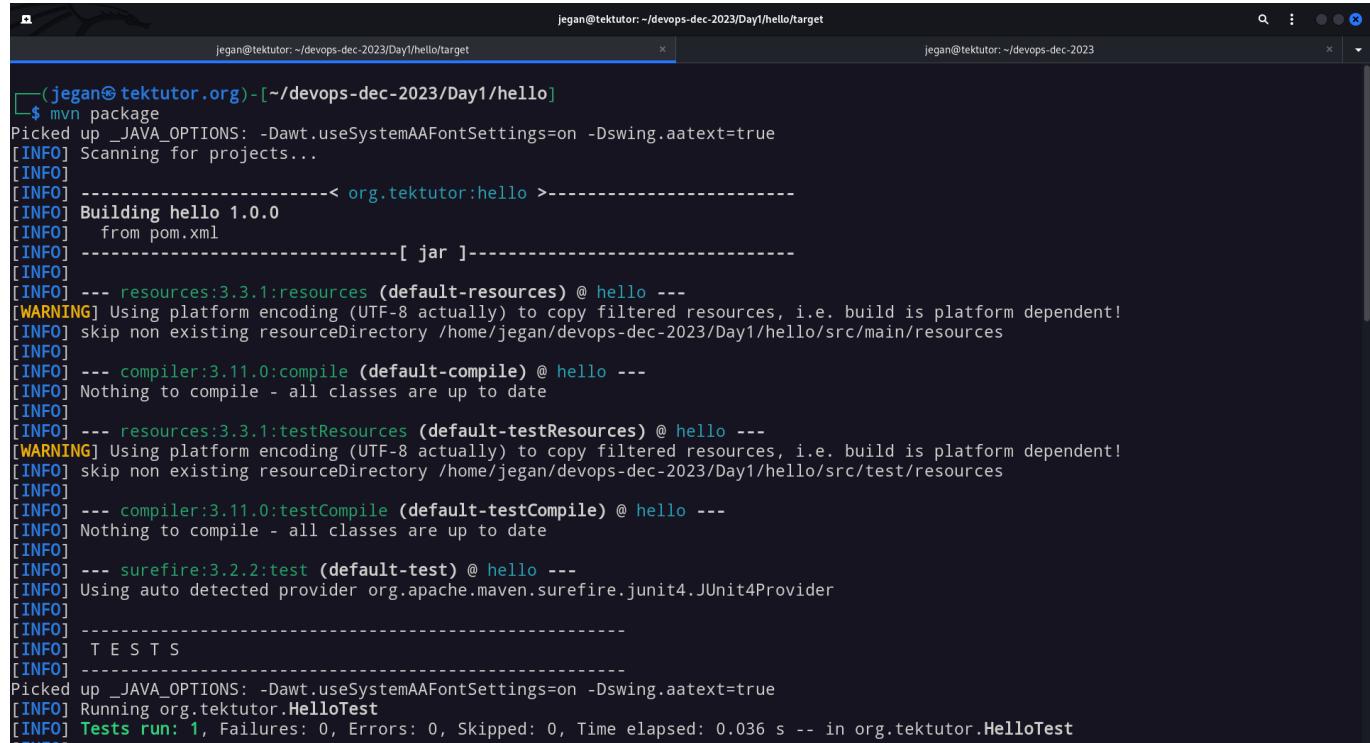
<http://localhost:8082/artifactory/tektutor/>

Lab - Packaging your application binaries as jar file

```
cd ~/devops-dec-2023
git pull
cd Day1/hello
mvn package
```

```
cd target  
ls
```

Expected output



The screenshot shows a terminal window with two tabs. The active tab displays the Maven package command output:

```
(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]  
$ mvn package  
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true  
[INFO] Scanning for projects...  
[INFO]  
[INFO] -----< org.tektutor:hello >-----  
[INFO] Building hello 1.0.0  
[INFO]   from pom.xml  
[INFO] -----[ jar ]-----  
[INFO]  
[INFO] --- resources:3.3.1:resources (default-resources) @ hello ---  
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!  
[INFO] skip non existing resourceDirectory /home/jegan/devops-dec-2023/Day1/hello/src/main/resources  
[INFO]  
[INFO] --- compiler:3.11.0:compile (default-compile) @ hello ---  
[INFO] Nothing to compile - all classes are up to date  
[INFO]  
[INFO] --- resources:3.3.1:testResources (default-testResources) @ hello ---  
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!  
[INFO] skip non existing resourceDirectory /home/jegan/devops-dec-2023/Day1/hello/src/test/resources  
[INFO]  
[INFO] --- compiler:3.11.0:testCompile (default-testCompile) @ hello ---  
[INFO] Nothing to compile - all classes are up to date  
[INFO]  
[INFO] --- surefire:3.2.2:test (default-test) @ hello ---  
[INFO] Using auto detected provider org.apache.maven.surefire.junit4.JUnit4Provider  
[INFO]  
[INFO] -----  
[INFO] T E S T S  
[INFO] -----  
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true  
[INFO] Running org.tektutor.HelloTest  
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.036 s -- in org.tektutor.HelloTest  
[INFO]
```

The screenshot shows two terminal windows side-by-side. Both windows have tabs at the top labeled 'jegan@tektutor: ~/devops-dec-2023/Day1/hello/target'.

Terminal 1 (Left): Maven Build Log

```
[INFO] -----
[INFO] T E S T S
[INFO] -----
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Running org.tektutor.HelloTest
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.036 s -- in org.tektutor.HelloTest
[INFO]
[INFO] Results:
[INFO]
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0
[INFO]
[INFO]
[INFO] --- jar:3.3.0:jar (default-jar) @ hello ---
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/shared/file-management/3.1.0/file-management-3.1.0.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/shared/file-management/3.1.0/file-management-3.1.0.pom (4.5 kB at 20 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/shared/maven-shared-components/36/maven-shared-component-s-36.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/shared/maven-shared-components/36/maven-shared-components-36.pom (4.9 kB at 288 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/archiver/3.6.0/maven-archiver-3.6.0.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/archiver/3.6.0/maven-archiver-3.6.0.pom (3.9 kB at 196 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-io/3.4.0/plexus-io-3.4.0.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-io/3.4.0/plexus-io-3.4.0.pom (6.0 kB at 354 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-archiver/4.4.0/plexus-archiver-4.4.0.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-archiver/4.4.0/plexus-archiver-4.4.0.pom (6.3 kB at 391 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/shared/file-management/3.1.0/file-management-3.1.0.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/shared/file-management/3.1.0/file-management-3.1.0.jar (3.6 kB at 1.6 MB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/archiver/3.6.0/maven-archiver-3.6.0.jar
Downloading from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-archiver/4.4.0/plexus-archiver-4.4.0.jar
```

Terminal 2 (Right): Directory Listing

```
jegan@tektutor: ~/devops-dec-2023/Day1/hello/target
jegan@tektutor: ~/devops-dec-2023
jegan@tektutor: ~
```

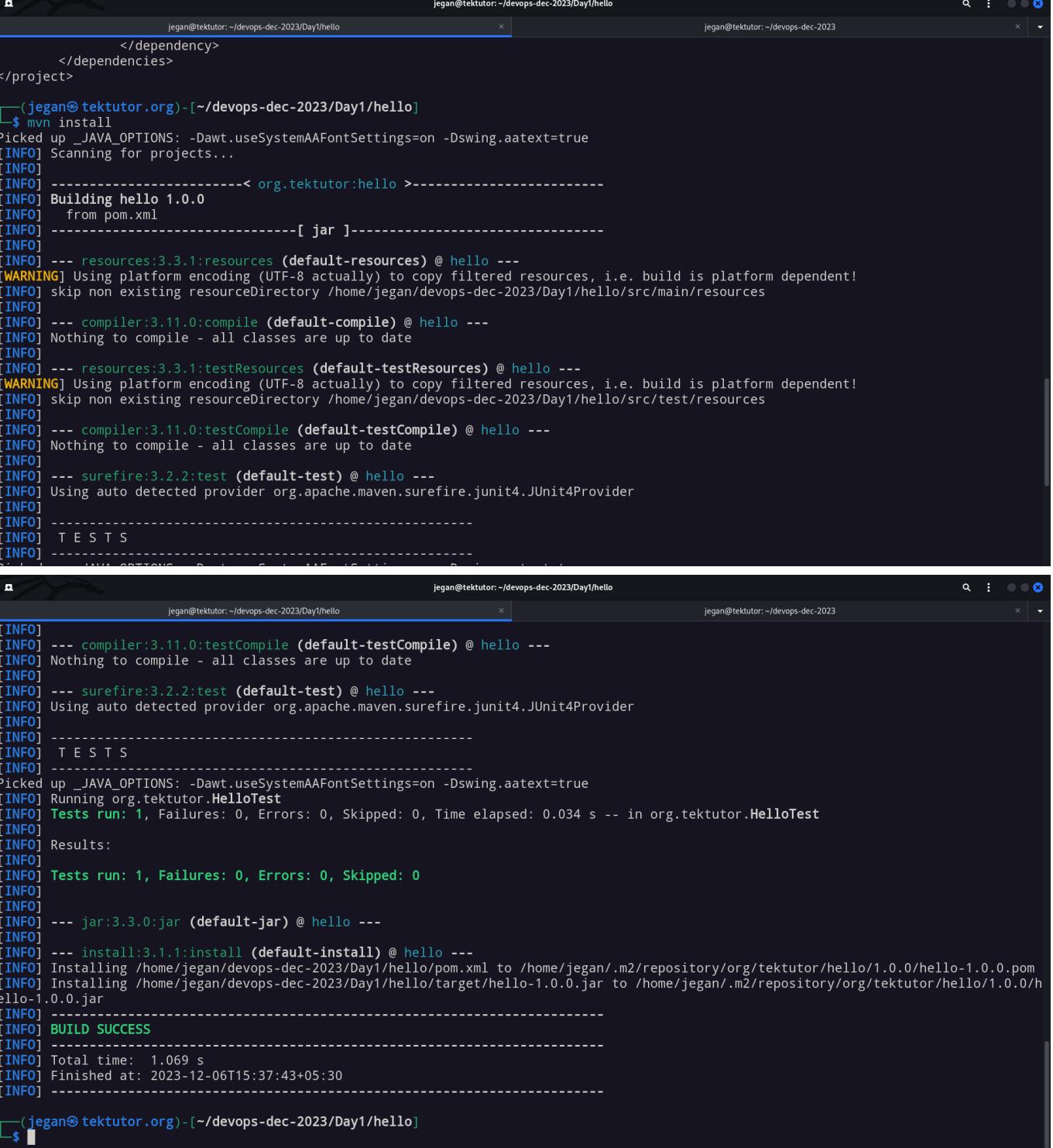
```
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-archiver/4.4.0/plexus-archiver-4.4.0.pom (6.3 kB at 391 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/shared/file-management/3.1.0/file-management-3.1.0.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/shared/file-management/3.1.0/file-management-3.1.0.jar (3.6 kB at 1.6 MB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/archiver/3.6.0/maven-archiver-3.6.0.jar
Downloading from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-archiver/4.4.0/plexus-archiver-4.4.0.jar
Downloading from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-io/3.4.0/plexus-io-3.4.0.jar
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/commons/commons-compress/1.21/commons-compress-1.21.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-archiver/4.4.0/plexus-archiver-4.4.0.jar (211 kB at 5.3 MB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/archiver/3.6.0/maven-archiver-3.6.0.jar (26 kB at 4.69 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-io/3.4.0/plexus-io-3.4.0.jar (79 kB at 605 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/commons/commons-compress/1.21/commons-compress-1.21.jar (1.0 MB at 4.7 MB/s)
[INFO] Building jar: /home/jegan/devops-dec-2023/Day1/hello/target/hello-1.0.0.jar
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 1.751 s
[INFO] Finished at: 2023-12-06T15:34:32+05:30
[INFO] -----
```

```
(jegan@ tektutor.org)-[~/devops-dec-2023/Day1/hello]
$ cd target
(jegan@ tektutor.org)-[~/devops-dec-2023/Day1/hello/target]
$ ls
classes generated-sources generated-test-sources hello-1.0.0.jar maven-archiver maven-status surefire-reports test-classes
(jegan@ tektutor.org)-[~/devops-dec-2023/Day1/hello/target]
$
```

Lab - Installing(copying) the application jar and respective pom files into Maven local repository

```
cd ~/devops-dec-2023
git pull
cd Day1/hello
mvn install
```

Expected output



```
jegan@tektutor: ~/devops-dec-2023/Day1/hello
</dependencies>
</project>
[jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
$ mvn install
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.tektutor:hello >-----
[INFO] Building hello 1.0.0
[INFO]   from pom.xml
[INFO] ----- [ jar ] -----
[INFO]
[INFO] --- resources:3.3.1:resources (default-resources) @ hello ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory /home/jegan/devops-dec-2023/Day1/hello/src/main/resources
[INFO]
[INFO] --- compiler:3.11.0:compile (default-compile) @ hello ---
[INFO] Nothing to compile - all classes are up to date
[INFO]
[INFO] --- resources:3.3.1:testResources (default-testResources) @ hello ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory /home/jegan/devops-dec-2023/Day1/hello/src/test/resources
[INFO]
[INFO] --- compiler:3.11.0:testCompile (default-testCompile) @ hello ---
[INFO] Nothing to compile - all classes are up to date
[INFO]
[INFO] --- surefire:3.2.2:test (default-test) @ hello ---
[INFO] Using auto detected provider org.apache.maven.surefire.junit4.JUnit4Provider
[INFO]
[INFO] -----
[INFO] T E S T S
[INFO] -----
[jegan@tektutor: ~/devops-dec-2023/Day1/hello
jegan@tektutor: ~/devops-dec-2023]
[jegan@tektutor: ~/devops-dec-2023/Day1/hello]
[jegan@tektutor: ~/devops-dec-2023]
[jegan@tektutor: ~/devops-dec-2023/Day1/hello]
[INFO]
[INFO] --- compiler:3.11.0:testCompile (default-testCompile) @ hello ---
[INFO] Nothing to compile - all classes are up to date
[INFO]
[INFO] --- surefire:3.2.2:test (default-test) @ hello ---
[INFO] Using auto detected provider org.apache.maven.surefire.junit4.JUnit4Provider
[INFO]
[INFO] -----
[INFO] T E S T S
[INFO] -----
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Running org.tektutor.HelloTest
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.034 s -- in org.tektutor.HelloTest
[INFO]
[INFO] Results:
[INFO]
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0
[INFO]
[INFO] -----
[INFO] --- jar:3.3.0:jar (default-jar) @ hello ---
[INFO]
[INFO] --- install:3.1.1:install (default-install) @ hello ---
[INFO] Installing /home/jegan/devops-dec-2023/Day1/hello/pom.xml to /home/jegan/.m2/repository/org/tektutor/hello/1.0.0/hello-1.0.0.pom
[INFO] Installing /home/jegan/devops-dec-2023/Day1/hello/target/hello-1.0.0.jar to /home/jegan/.m2/repository/org/tektutor/hello/1.0.0/hello-1.0.0.jar
[INFO]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 1.069 s
[INFO] Finished at: 2023-12-06T15:37:43+05:30
[INFO] -----
```

Lab - Deploying application packaged jar files into JFrog Artifactory server

As it is if we attempt to perform deploy, it would fail as shown below

```
cd ~/devops-dec-2023
git pull
cd Day1/hello
mvn deploy
```

Expected output

```
jegan@tektutor: ~/devops-dec-2023/Day1/hello
[jegan@tektutor: ~/devops-dec-2023/Day1/hello]
[INFO] Installing /home/jegan/devops-dec-2023/Day1/hello/target/hello-1.0.0.jar to /home/jegan/.m2/repository/org/tektutor/hello/1.0.0/hello-1.0.0.jar
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time:  1.069 s
[INFO] Finished at: 2023-12-06T15:37:43+05:30
[INFO] -----
```

(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]

```
$ mvn deploy
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO]
[INFO] < org.tektutor:hello >-----
[INFO] Building hello 1.0.0
[INFO]   from pom.xml
[INFO]   -----[ jar ]-----
[INFO]
[INFO] --- resources:3.3.1:resources (default-resources) @ hello ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory /home/jegan/devops-dec-2023/Day1/hello/src/main/resources
[INFO]
[INFO] --- compiler:3.11.0:compile (default-compile) @ hello ---
[INFO] Nothing to compile - all classes are up to date
[INFO]
[INFO] --- resources:3.3.1:testResources (default-testResources) @ hello ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory /home/jegan/devops-dec-2023/Day1/hello/src/test/resources
[INFO]
[INFO] --- compiler:3.11.0:testCompile (default-testCompile) @ hello ---
[INFO] Nothing to compile - all classes are up to date
[INFO]
[INFO] --- surefire:3.2.2:test (default-test) @ hello ---
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0
```

jegan@tektutor: ~/devops-dec-2023/Day1/hello

```
jegan@tektutor: ~/devops-dec-2023/Day1/hello
[jegan@tektutor: ~/devops-dec-2023/Day1/hello]
[INFO] Running org.tektutor.HelloTest
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.035 s -- in org.tektutor.HelloTest
[INFO]
[INFO] Results:
[INFO]
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0
[INFO]
[INFO] --- jar:3.3.0:jar (default-jar) @ hello ---
[INFO]
[INFO] --- install:3.1.1:install (default-install) @ hello ---
[INFO] Installing /home/jegan/devops-dec-2023/Day1/hello/pom.xml to /home/jegan/.m2/repository/org/tektutor/hello/1.0.0/hello-1.0.0.pom
[INFO] Installing /home/jegan/devops-dec-2023/Day1/hello/target/hello-1.0.0.jar to /home/jegan/.m2/repository/org/tektutor/hello/1.0.0/hello-1.0.0.jar
[INFO]
[INFO] --- deploy:3.1.1:deploy (default-deploy) @ hello ---
[INFO]
[INFO] BUILD FAILURE
[INFO]
[INFO] Total time:  1.105 s
[INFO] Finished at: 2023-12-06T15:44:02+05:30
[INFO]
[ERROR] Failed to execute goal org.apache.maven.plugins:maven-deploy-plugin:3.1.1:deploy (default-deploy) on project hello: Deployment failed: repository element was not specified in the POM inside distributionManagement element or in -DaltDeploymentRepository=id::url parameter -> [Help 1]
[ERROR]
[ERROR] To see the full stack trace of the errors, re-run Maven with the -e switch.
[ERROR] Re-run Maven using the -X switch to enable full debug logging.
[ERROR]
[ERROR] For more information about the errors and possible solutions, please read the following articles:
[ERROR] [Help 1] http://cwiki.apache.org/confluence/display/MAVEN/MojoExecutionException
```

(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]

This is because, we are yet to configure the JFrog Artifactory URL in the pom.xml file.

Hence we need to configure the pom.xml as shown below

```
jegan@tektutor: ~/devops-dec-2023/Day1/hello
jegan@tektutor: ~/devops-dec-2023/Day1/hello
<project>
    <modelVersion>4.0.0</modelVersion>

    <groupId>org.tektutor</groupId>
    <artifactId>hello</artifactId>
    <version>1.0.0</version>

    <dependencies>
        <dependency>
            <groupId>junit</groupId>
            <artifactId>junit</artifactId>
            <version>4.12</version>
        </dependency>
    </dependencies>

    <distributionManagement>
        <repository>
            <id>jfrog</id>
            <url>http://localhost:8082/artifactory/tektutor/</url>
        </repository>
    </distributionManagement>
</project>
~
```

19,51-72 All

Let's attempt to deploy the jar file as we are done with the pom.xml configuration

```
cd ~/devops-dec-2023
git pull
cd Day1/hello
mvn deploy
```

Expected output

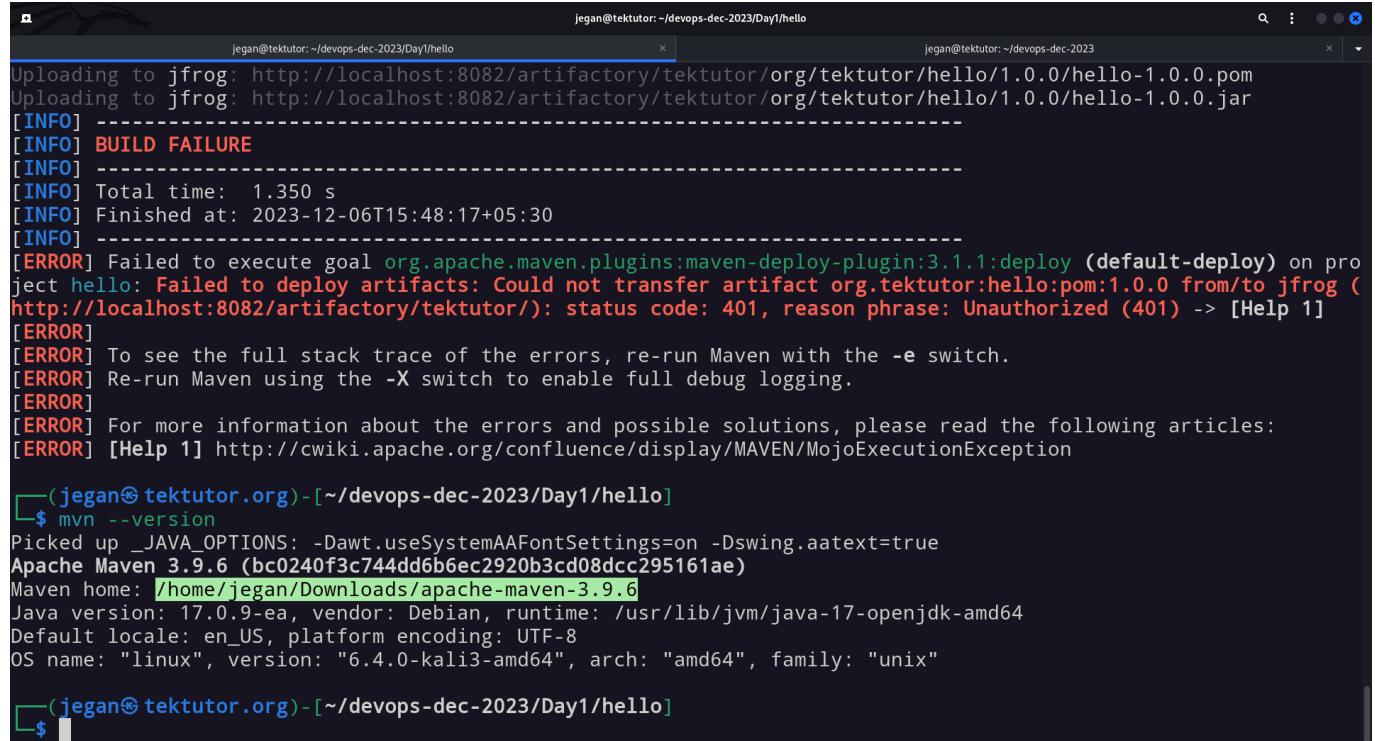
```
jegan@tektutor: ~/devops-dec-2023/Day1/hello
jegan@tektutor: ~/devops-dec-2023/Day1/hello
[INFO] Building jar: /home/jegan/devops-dec-2023/Day1/hello/target/hello-1.0.0.jar
[INFO]
[INFO] --- install:3.1.1:install (default-install) @ hello ---
[INFO] Installing /home/jegan/devops-dec-2023/Day1/hello/pom.xml to /home/jegan/.m2/repository/org/tektutor/hello/1.0.0/hello-1.0.0.pom
[INFO] Installing /home/jegan/devops-dec-2023/Day1/hello/target/hello-1.0.0.jar to /home/jegan/.m2/repository/org/tektutor/hello/1.0.0/hello-1.0.0.jar
[INFO]
[INFO] --- deploy:3.1.1:deploy (default-deploy) @ hello ---
Uploading to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/1.0.0/hello-1.0.0.pom
Uploading to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/1.0.0/hello-1.0.0.jar
[INFO] -----
[INFO] BUILD FAILURE
[INFO] -----
[INFO] Total time: 1.350 s
[INFO] Finished at: 2023-12-06T15:48:17+05:30
[INFO] -----
[ERROR] Failed to execute goal org.apache.maven.plugins:maven-deploy-plugin:3.1.1:deploy (default-deploy) on project hello: Failed to deploy artifacts: Could not transfer artifact org.tektutor:hello:pom:1.0.0 from/to jfrog (http://localhost:8082/artifactory/tektutor/): status code: 401, reason phrase: Unauthorized (401) -> [Help 1]
[ERROR]
[ERROR] To see the full stack trace of the errors, re-run Maven with the -e switch.
[ERROR] Re-run Maven using the -X switch to enable full debug logging.
[ERROR]
[ERROR] For more information about the errors and possible solutions, please read the following articles:
[ERROR] [Help 1] http://cwiki.apache.org/confluence/display/MAVEN/MojoExecutionException
(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
```

The above is due to the unauthorized login, i.e we need to configure maven settings.xml file with the JFrog Artifactory login credentials, so that maven can login into the JFrog Artifactory server and then can successfully deploy the application jar and poms respectively.

Finding your maven installation path

```
mvn --version
```

Expected output



A screenshot of a terminal window titled "jegan@tektutor: ~/devops-dec-2023/Day1/hello". The window shows the command "mvn --version" being run and its output. The output includes Maven version information (Apache Maven 3.9.6), Java version, and system details. It also shows a failed deployment attempt to JFrog Artifactory due to an unauthorized error.

```
jegan@tektutor: ~/devops-dec-2023/Day1/hello
jegan@tektutor: ~/devops-dec-2023
Uploading to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/1.0.0/hello-1.0.0.pom
Uploading to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/1.0.0/hello-1.0.0.jar
[INFO] -----
[INFO] BUILD FAILURE
[INFO] -----
[INFO] Total time:  1.350 s
[INFO] Finished at: 2023-12-06T15:48:17+05:30
[INFO] -----
[ERROR] Failed to execute goal org.apache.maven.plugins:maven-deploy-plugin:3.1.1:deploy (default-deploy) on project hello: Failed to deploy artifacts: Could not transfer artifact org.tektutor:hello:pom:1.0.0 from/to jfrog (http://localhost:8082/artifactory/tektutor/): status code: 401, reason phrase: Unauthorized (401) -> [Help 1]
[ERROR]
[ERROR] To see the full stack trace of the errors, re-run Maven with the -e switch.
[ERROR] Re-run Maven using the -X switch to enable full debug logging.
[ERROR]
[ERROR] For more information about the errors and possible solutions, please read the following articles:
[ERROR] [Help 1] http://cwiki.apache.org/confluence/display/MAVEN/MojoExecutionException

(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
$ mvn --version
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
Apache Maven 3.9.6 (bc0240f3c744dd6b6ec2920b3cd08dcc295161ae)
Maven home: /home/jegan/Downloads/apache-maven-3.9.6
Java version: 17.0.9-ea, vendor: Debian, runtime: /usr/lib/jvm/java-17-openjdk-amd64
Default locale: en_US, platform encoding: UTF-8
OS name: "linux", version: "6.4.0-kali3-amd64", arch: "amd64", family: "unix"

(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
$
```

We can now edit the settings.xml file at the below path

```
gedit /home/jegan/Downloads/apache-maven-3.9.6/conf/settings.xml
```

Expected output

```
jegan@tektutor: ~/devops-dec-2023/Day1/hello
Uploading to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/1.0.0/hello-1.0.0.pom
Uploading to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/1.0.0/hello-1.0.0.jar
[INFO] -----
[INFO] BUILD FAILURE
[INFO] -----
[INFO] Total time:  1.350 s
[INFO] Finished at: 2023-12-06T15:48:17+05:30
[INFO] -----
[ERROR] Failed to execute goal org.apache.maven.plugins:maven-deploy-plugin:3.1.1:deploy (default-deploy) on project hello: Failed to deploy artifacts: Could not transfer artifact org.tektutor:hello:pom:1.0.0 from/to jfrog (http://localhost:8082/artifactory/tektutor/): status code: 401, reason phrase: Unauthorized (401) -> [Help 1]
[ERROR]
[ERROR] To see the full stack trace of the errors, re-run Maven with the -e switch.
[ERROR] Re-run Maven using the -X switch to enable full debug logging.
[ERROR]
[ERROR] For more information about the errors and possible solutions, please read the following articles:
[ERROR] [Help 1] http://cwiki.apache.org/confluence/display/MAVEN/MojoExecutionException

(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
$ mvn -version
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
Apache Maven 3.9.6 (bc0240f3c744dd6b6ec2920b3cd08dcc295161ae)
Maven home: /home/jegan/Downloads/apache-maven-3.9.6
Java version: 17.0.9-ea, vendor: Debian, runtime: /usr/lib/jvm/java-17-openjdk-amd64
Default locale: en_US, platform encoding: UTF-8
OS name: "linux", version: "6.4.0-kali3-amd64", arch: "amd64", family: "unix"

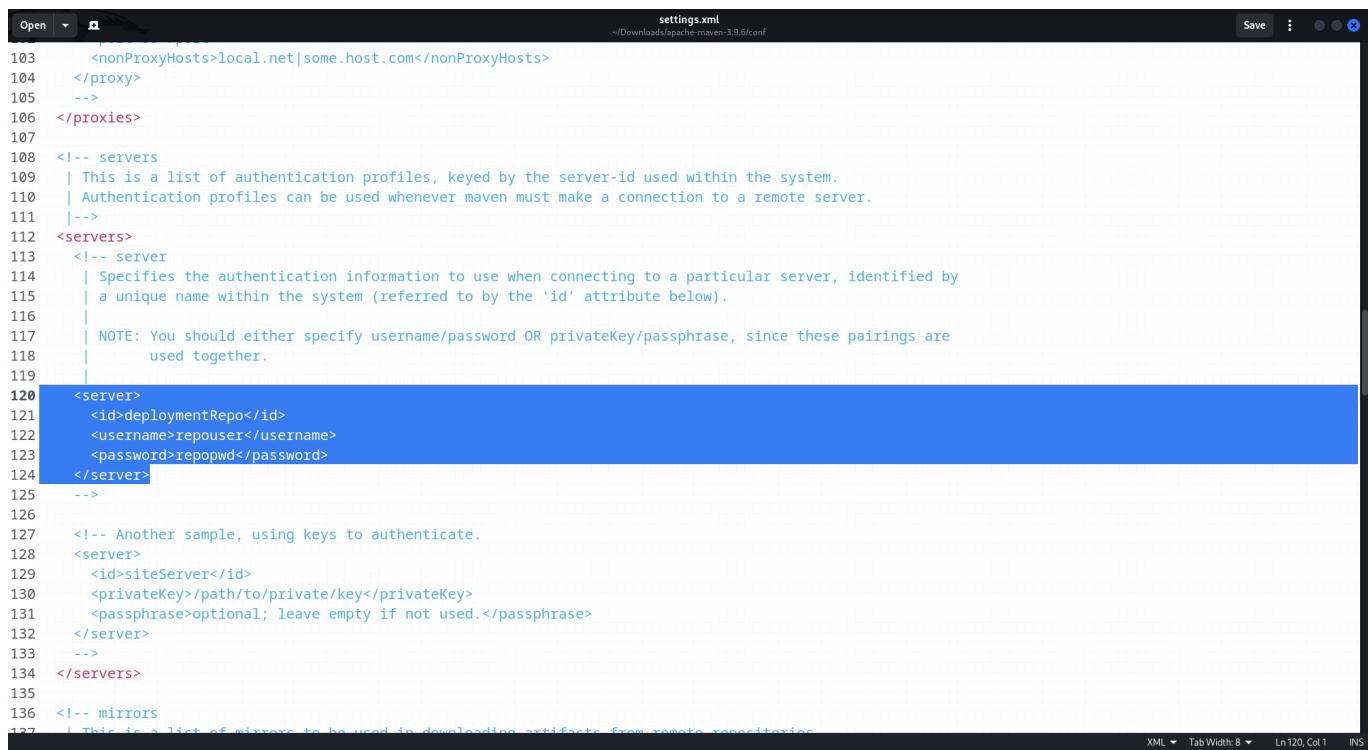
(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
$ gedit /home/jegan/Downloads/apache-maven-3.9.6/conf/settings.xml
```

Navigate to line number 112

```
settings.xml
~/Downloads/apache-maven-3.9.6/conf

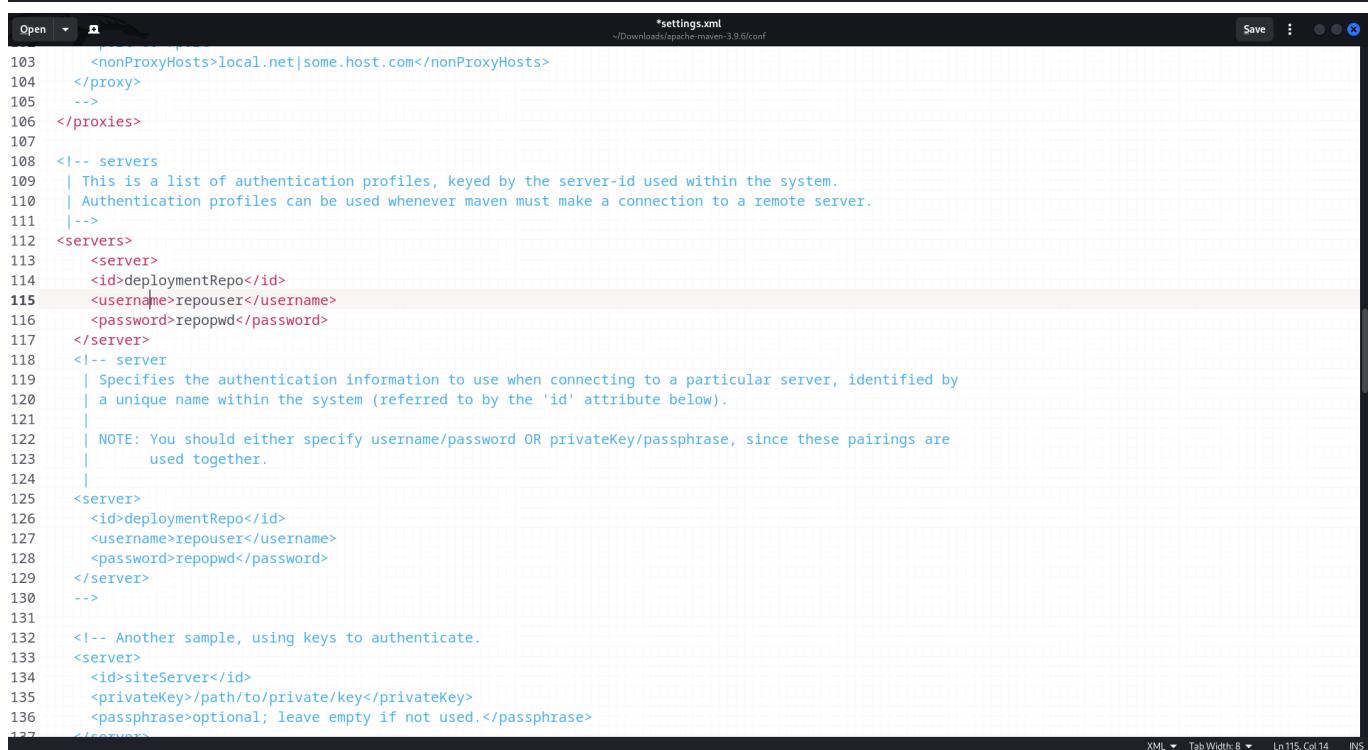
103   <nonProxyHosts>local.net|some.host.com</nonProxyHosts>
104 </proxy>
105 ---
106 </proxies>
107
108 <!-- servers
109 | This is a list of authentication profiles, keyed by the server-id used within the system.
110 | Authentication profiles can be used whenever maven must make a connection to a remote server.
111 | -->
112 <servers>
113   <!-- server
114   | Specifies the authentication information to use when connecting to a particular server, identified by
115   | a unique name within the system (referred to by the 'id' attribute below).
116   |
117   | NOTE: You should either specify username/password OR privateKey/passphrase, since these pairings are
118   |       used together.
119   |
120 <server>
121   <id>deploymentRepo</id>
122   <username>repouser</username>
123   <password>repopwd</password>
124 </server>
125 ---
126
127 <!-- Another sample, using keys to authenticate.
128 <server>
129   <id>siteServer</id>
130   <privateKey>/path/to/private/key</privateKey>
131   <passphrase>optional; leave empty if not used.</passphrase>
132 </server>
133 ---
134 </servers>
135
136 <!-- MIRRORS
137 | This is a list of mirrors to be used in downloading artifacts from remote repositories.
```

Copy the lines between line numbers 120 to 124 from the commented section and paste it below line number 112 as shown below



```
settings.xml
~/Downloads/apache-maven-3.9.6/conf

103   <nonProxyHosts>local.net|some.host.com</nonProxyHosts>
104   </proxy>
105   -->
106   </proxies>
107
108   <!-- servers
109   | This is a list of authentication profiles, keyed by the server-id used within the system.
110   | Authentication profiles can be used whenever maven must make a connection to a remote server.
111   |-->
112   <servers>
113     <!-- server
114     | Specifies the authentication information to use when connecting to a particular server, identified by
115     | a unique name within the system (referred to by the 'id' attribute below).
116     |
117     | NOTE: You should either specify username/password OR privateKey/passphrase, since these pairings are
118     |       used together.
119     |
120     <server>
121       <id>deploymentRepo</id>
122       <username>repouser</username>
123       <password>repopwd</password>
124     </server>
125   -->
126
127   <!-- Another sample, using keys to authenticate.
128   <server>
129     <id>siteServer</id>
130     <privateKey>/path/to/private/key</privateKey>
131     <passphrase>optional; leave empty if not used.</passphrase>
132   </server>
133   -->
134 </servers>
135
136 <!-- mirrors
137 | This is a list of mirrors to be used in downloading artifacts from remote repositories.
138 |-->
```



```
*settings.xml
~/Downloads/apache-maven-3.9.6/conf

103   <nonProxyHosts>local.net|some.host.com</nonProxyHosts>
104   </proxy>
105   -->
106   </proxies>
107
108   <!-- servers
109   | This is a list of authentication profiles, keyed by the server-id used within the system.
110   | Authentication profiles can be used whenever maven must make a connection to a remote server.
111   |-->
112   <servers>
113     <!-- server
114     | Specifies the authentication information to use when connecting to a particular server, identified by
115     | a unique name within the system (referred to by the 'id' attribute below).
116     |
117     | NOTE: You should either specify username/password OR privateKey/passphrase, since these pairings are
118     |       used together.
119     |
120     <server>
121       <id>deploymentRepo</id>
122       <username>repouser</username>
123       <password>repopwd</password>
124     </server>
125   <!-- server
126   | Specifies the authentication information to use when connecting to a particular server, identified by
127   | a unique name within the system (referred to by the 'id' attribute below).
128   |
129   | NOTE: You should either specify username/password OR privateKey/passphrase, since these pairings are
130   |       used together.
131   |
132   <!-- Another sample, using keys to authenticate.
133   <server>
134     <id>siteServer</id>
135     <privateKey>/path/to/private/key</privateKey>
136     <passphrase>optional; leave empty if not used.</passphrase>
137   </server>
```

Now edit the lines 113 thru 116 as shown below

```

103     <nonProxyHosts>local.net|some.host.com</nonProxyHosts>
104   </proxy>
105   -->
106 </proxies>
107
108 <!-- servers
109 | This is a list of authentication profiles, keyed by the server-id used within the system.
110 | Authentication profiles can be used whenever maven must make a connection to a remote server.
111 |-->
112 <servers>
113   <server>
114     <id>jfrog</id>
115     <username>admin</username>
116     <password>Rps@12345</password>
117   </server>
118 <!-- server
119 | Specifies the authentication information to use when connecting to a particular server, identified by
120 | a unique name within the system (referred to by the 'id' attribute below).
121 |
122 | NOTE: You should either specify username/password OR privateKey/passphrase, since these pairings are
123 |       used together.
124 |
125 <server>
126   <id>deploymentRepo</id>
127   <username>repouser</username>
128   <password>repopwd</password>
129 </server>
130 -->
131
132 <!-- Another sample, using keys to authenticate.
133 <server>
134   <id>siteServer</id>
135   <privateKey>/path/to/private/key</privateKey>
136   <passphrase>optional; leave empty if not used.</passphrase>
137 </server>

```

Bracket match found on line: T16

XML Tab Width: 8 Ln 116, Col 26 IN5

Save the changes and close gedit editor.

Let's check the JFrog Artifactory deployment url to see it empty

Name	Last Modified	Size	Download Link
No items found.			

Artifactory/7.71.5 Server

Now you may try to deploy as shown below

```

cd ~/devops-dec-2023
git pull
cd Day1/hello
mvn deploy

```

Expected output

The screenshot shows a terminal window with two tabs. The left tab shows the command `mvn deploy` being run in a directory named `Day1/hello`. The right tab shows the output of the command.

```
jegan@tektutor: ~/devops-dec-2023/Day1/hello
jegan@tektutor: ~/devops-dec-2023
To https://github.com/tektutor/devops-dec-2023
  1f219c1..fcf04a7  main -> main
branch 'main' set up to track 'origin/main'.

[jegan@tektutor.org]-(~/devops-dec-2023)
$ cd Day1/hello

[jegan@tektutor.org]-(~/devops-dec-2023/Day1/hello]
$ mvn deploy
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.tektutor:hello >-----
[INFO] Building hello 1.0.0
[INFO]   from pom.xml
[INFO] -----[ jar ]-----
[INFO]
[INFO] --- resources:3.3.1:resources (default-resources) @ hello ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory /home/jegan/devops-dec-2023/Day1/hello/src/main/resources
[INFO]
[INFO] --- compiler:3.11.0:compile (default-compile) @ hello ---
[INFO] Changes detected - recompiling the module! :source
[WARNING] File encoding has not been set, using platform encoding UTF-8, i.e. build is platform dependent!
[INFO] Compiling 1 source file with javac [debug target 1.8] to target/classes
[WARNING] bootstrap class path not set in conjunction with -source 8
[INFO]
[INFO] --- resources:3.3.1:testResources (default-testResources) @ hello ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
```

```
jegan@tektutor: ~/devops-dec-2023/Day1/hello
[jegan@tektutor: ~/devops-dec-2023/Day1/hello]-----[jegan@tektutor: ~/devops-dec-2023]
[INFO] Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Running org.tektutor.HelloTest
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.035 s -- in org.tektutor.HelloTest
[INFO]
[INFO] Results:
[INFO]
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0
[INFO]
[INFO]
[INFO] --- jar:3.3.0:jar (default-jar) @ hello ---
[INFO] Building jar: /home/jegan/devops-dec-2023/Day1/hello/target/hello-1.0.0.jar
[INFO]
[INFO] --- install:3.1.1:install (default-install) @ hello ---
[INFO] Installing /home/jegan/devops-dec-2023/Day1/hello/pom.xml to /home/jegan/.m2/repository/org/tektutor/hello/1.0.0/hello-1.0.0.pom
[INFO] Installing /home/jegan/devops-dec-2023/Day1/hello/target/hello-1.0.0.jar to /home/jegan/.m2/repository/org/tektutor/hello/1.0.0/hello-1.0.0.jar
[INFO]
[INFO] --- deploy:3.1.1:deploy (default-deploy) @ hello ---
Uploading to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/1.0.0/hello-1.0.0.pom
Uploaded to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/1.0.0/hello-1.0.0.pom (464 B at 2.2 kB/s)
Uploading to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/1.0.0/hello-1.0.0.jar
Uploaded to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/1.0.0/hello-1.0.0.jar (2.0 kB at 69 kB/s)
Downloading from jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/maven-metadata.xml
Downloaded from jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/maven-metadata.xml (372 B at 10 kB/s)

jegan@tektutor: ~/devops-dec-2023/Day1/hello
[jegan@tektutor: ~/devops-dec-2023/Day1/hello]-----[jegan@tektutor: ~/devops-dec-2023]
[INFO] --- install:3.1.1:install (default-install) @ hello ---
[INFO] Installing /home/jegan/devops-dec-2023/Day1/hello/pom.xml to /home/jegan/.m2/repository/org/tektutor/hello/1.0.0/hello-1.0.0.pom
[INFO] Installing /home/jegan/devops-dec-2023/Day1/hello/target/hello-1.0.0.jar to /home/jegan/.m2/repository/org/tektutor/hello/1.0.0/hello-1.0.0.jar
[INFO]
[INFO] --- deploy:3.1.1:deploy (default-deploy) @ hello ---
Uploading to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/1.0.0/hello-1.0.0.pom
Uploaded to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/1.0.0/hello-1.0.0.pom (464 B at 2.2 kB/s)
Uploading to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/1.0.0/hello-1.0.0.jar
Uploaded to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/1.0.0/hello-1.0.0.jar (2.0 kB at 69 kB/s)
Downloading from jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/maven-metadata.xml
Downloaded from jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/maven-metadata.xml (372 B at 10 kB/s)
Uploading to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/maven-metadata.xml
Uploaded to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/hello/maven-metadata.xml (324 B at 11 kB/s)
[INFO] -----[INFO] BUILD SUCCESS[INFO] -----
[INFO] Total time: 1.897 s
[INFO] Finished at: 2023-12-06T15:59:38+05:30
[INFO] -----
```

Now let us again check the JFrog Artifactory deployment url to notice the jar and pom files got deployed

Index of tektutor/org/tektutor/hello/1.0.0

Name	Last Modified	Size	Download Link
.. /			
hello-1.0.0.jar	06-12-23 16:08:43 +0530	2.0 KB	hello-1.0.0.jar
hello-1.0.0.pom	06-12-23 16:08:43 +0530	464.0 B	hello-1.0.0.pom

Artifactory/7.71.5 Server

If you are able to see your jar and poms deployed onto JFrog Artifactory server, you have successfully deployed !

Info - What is Super POM?

- this comes with Maven installation
- you can find this Super POM inside maven-installation-folder/lib/maven-model-xxxx.jar
- this file has all the default global configuration like maven central repo url, plugin repo url, life-cycle phase and its respective plugin configurations

Info - What is Parent POM?

- this is the top level pom file we manually create
- this parent pom will have the name of the parent module defined in terms of maven co-ordinates
- will have common dependencies and configurations which will be inherited by all child modules
- the parent pom packaging must be marked as pom as they are not allowed to have source code
- the parent module will have one or more module element for each child module

Info - What is Child POM?

- every child module in a multi module project will have pom.xml under the child module folder which is referred as the Child POM
- Child modules can optionally have source code, ie. this also could be parent some other child modules

Info - What is Effective POM?

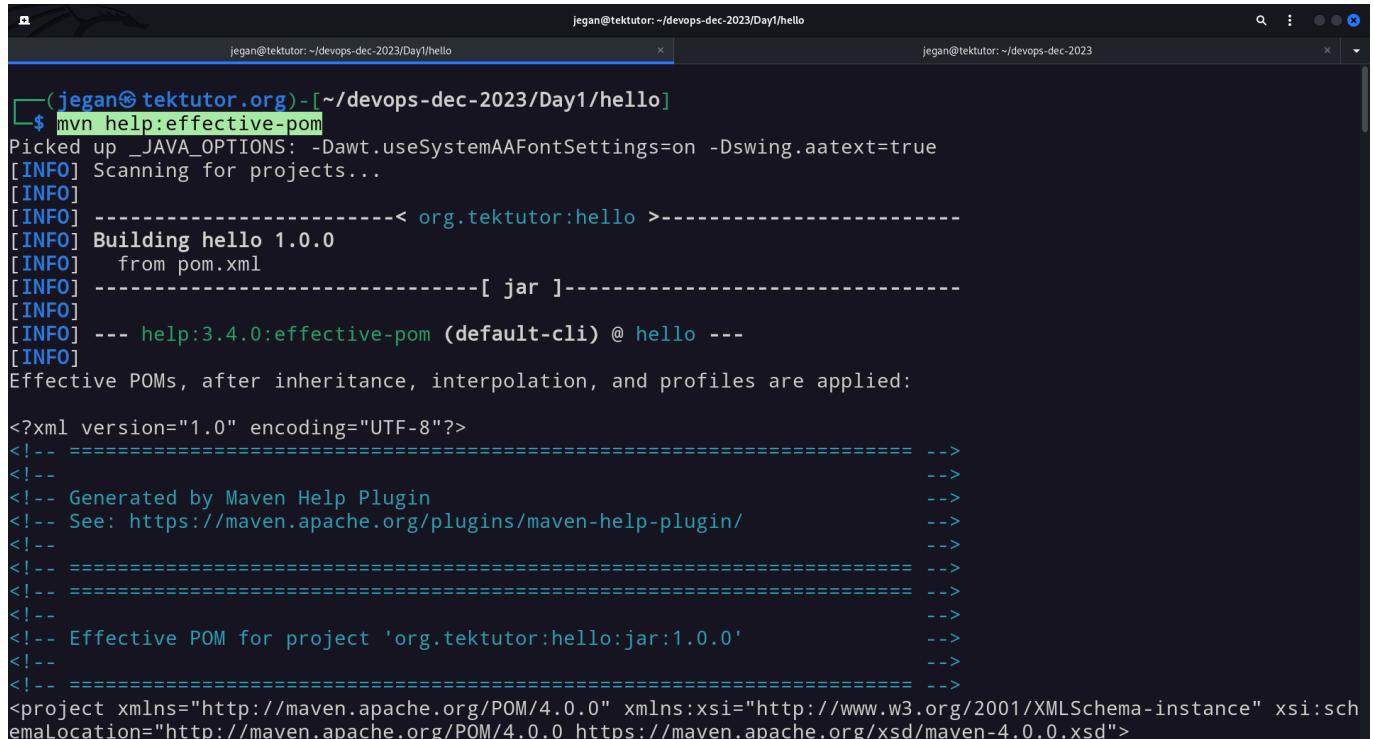
- Effective POM is the combination of properties, configurations inherited by Parent POM from the Super POM
- Effective POM from the point of child pom would have inherited everything from its immediate parent

- this is how maven learns all the required properties to build a maven project

Lab - Printing the effective pom for CRM parent module

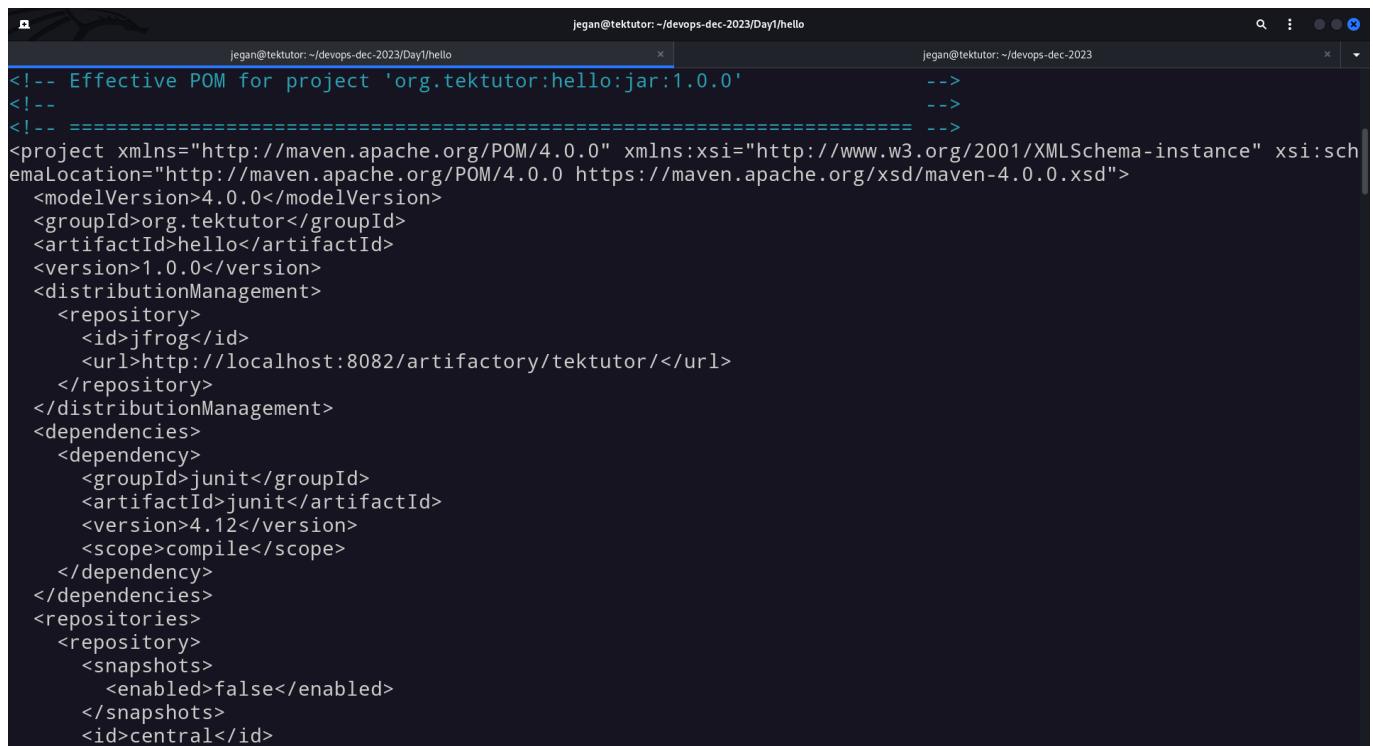
```
cd ~/devops-dec-2023
git pull
cd Day1/multi-module-project
mvn help:effective-pom
```

Expected output



```
(jegan@tektutor.org)-[~/devops-dec-2023/Day1/hello]
$ mvn help:effective-pom
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.tektutor:hello >-----
[INFO] Building hello 1.0.0
[INFO]   from pom.xml
[INFO] -----[ jar ]-----
[INFO]
[INFO] --- help:3.4.0:effective-pom (default-cli) @ hello ---
[INFO]
Effective POMs, after inheritance, interpolation, and profiles are applied:

<?xml version="1.0" encoding="UTF-8"?>
<!-- ===== -->
<!-- Generated by Maven Help Plugin -->
<!-- See: https://maven.apache.org/plugins/maven-help-plugin/ -->
<!-- ===== -->
<!-- ===== -->
<!-- ===== -->
<!-- Effective POM for project 'org.tektutor:hello:jar:1.0.0' -->
<!-- ===== -->
<!-- ===== -->
<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 https://maven.apache.org/xsd/maven-4.0.0.xsd">
```

```
<!-- Effective POM for project 'org.tektutor:hello:jar:1.0.0' -->
<!-- ===== -->
<!-- ===== -->
<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 https://maven.apache.org/xsd/maven-4.0.0.xsd">
  <modelVersion>4.0.0</modelVersion>
  <groupId>org.tektutor</groupId>
  <artifactId>hello</artifactId>
  <version>1.0.0</version>
  <distributionManagement>
    <repository>
      <id>jfrog</id>
      <url>http://localhost:8082/artifactory/tektutor/</url>
    </repository>
  </distributionManagement>
  <dependencies>
    <dependency>
      <groupId>junit</groupId>
      <artifactId>junit</artifactId>
      <version>4.12</version>
      <scope>compile</scope>
    </dependency>
  </dependencies>
  <repositories>
    <repository>
      <snapshots>
        <enabled>false</enabled>
      </snapshots>
      <id>central</id>
```

The screenshot shows two terminal windows side-by-side. The left window displays the `pom.xml` file for a Maven project named "hello". It includes sections for repositories, plugin repositories, and resources. The right window shows the command-line output of a Maven build, starting with the configuration of report plugins and reporting, followed by a success message.

```
<repository>
  <snapshots>
    <enabled>false</enabled>
  </snapshots>
  <id>central</id>
  <name>Central Repository</name>
  <url>https://repo.maven.apache.org/maven2</url>
</repository>
</repositories>
<pluginRepositories>
  <pluginRepository>
    <releases>
      <updatePolicy>never</updatePolicy>
    </releases>
    <snapshots>
      <enabled>false</enabled>
    </snapshots>
    <id>central</id>
    <name>Central Repository</name>
    <url>https://repo.maven.apache.org/maven2</url>
  </pluginRepository>
</pluginRepositories>
<build>
  <sourceDirectory>/home/jegan/devops-dec-2023/Day1/hello/src/main/java</sourceDirectory>
  <scriptSourceDirectory>/home/jegan/devops-dec-2023/Day1/hello/src/main/scripts</scriptSourceDirectory>
  <testSourceDirectory>/home/jegan/devops-dec-2023/Day1/hello/src/test/java</testSourceDirectory>
  <outputDirectory>/home/jegan/devops-dec-2023/Day1/hello/target/classes</outputDirectory>
  <testOutputDirectory>/home/jegan/devops-dec-2023/Day1/hello/target/test-classes</testOutputDirectory>
<resources>
```



```
<reportPlugin>
  <groupId>org.apache.maven.plugins</groupId>
  <artifactId>maven-project-info-reports-plugin</artifactId>
</reportPlugin>
</reportPlugins>
</configuration>
</execution>
</executions>
<configuration>
  <outputDirectory>/home/jegan/devops-dec-2023/Day1/hello/target/site</outputDirectory>
  <reportPlugins>
    <reportPlugin>
      <groupId>org.apache.maven.plugins</groupId>
      <artifactId>maven-project-info-reports-plugin</artifactId>
    </reportPlugin>
  </reportPlugins>
</configuration>
</plugin>
</plugins>
</build>
<reporting>
  <outputDirectory>/home/jegan/devops-dec-2023/Day1/hello/target/site</outputDirectory>
</reporting>
</project>
```

[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----

Lab - Multi module project

```
cd ~/devops-dec-2023
git pull
cd Day1/multi-module-project
mvn compile
mvn install
mvn deploy
```

Expected output

```
jegan@tektutor: ~/devops-dec-2023/Day1/multi-module-project
jegan@tektutor: ~/devops-dec-2023
06bf48..4d0f78c main -> main
branch 'main' set up to track 'origin/main'.

[jegan@tektutor.org)-[~/devops-dec-2023]
$ cd Day1/multi-module-project

[jegan@tektutor.org)-[~/devops-dec-2023/Day1/multi-module-project]
$ mvn compile
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO] -----
[INFO] Reactor Build Order:
[INFO]
[INFO] crm                               [pom]
[INFO] dal                               [jar]
[INFO] bl                                [jar]
[INFO] fe                                [jar]
[INFO] main                             [jar]
[INFO]
[INFO] -----< org.tektutor:crm >-----
[INFO] Building crm 1.0.0                  [1/5]
[INFO]   from pom.xml
[INFO] -----[ pom ]-----
[INFO]
[INFO] -----< org.tektutor:dal >-----
[INFO] Building dal 1.0.0                  [2/5]
[INFO]   from dal/pom.xml
[INFO] -----[ jar ]-----
[INFO]

jegan@tektutor: ~/devops-dec-2023/Day1/multi-module-project
jegan@tektutor: ~/devops-dec-2023
[INFO] -----[ jar ]-----
[INFO]
[INFO] --- resources:3.3.1:resources (default-resources) @ main ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory /home/jegan/devops-dec-2023/Day1/multi-module-project/main/src/main/resources
[INFO]
[INFO] --- compiler:3.11.0:compile (default-compile) @ main ---
[INFO] Changes detected - recompiling the module! :dependency
[WARNING] File encoding has not been set, using platform encoding UTF-8, i.e. build is platform dependent!
[INFO] Compiling 1 source file with javac [debug target 1.8] to target/classes
[WARNING] bootstrap class path not set in conjunction with -source 8
[INFO] -----
[INFO] Reactor Summary for crm 1.0.0:
[INFO]
[INFO] crm ..... SUCCESS [ 0.001 s]
[INFO] dal ..... SUCCESS [ 0.566 s]
[INFO] bl ..... SUCCESS [ 0.035 s]
[INFO] fe ..... SUCCESS [ 0.024 s]
[INFO] main ..... SUCCESS [ 0.024 s]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time:  0.732 s
[INFO] Finished at: 2023-12-06T17:56:41+05:30
[INFO] -----


[jegan@tektutor.org)-[~/devops-dec-2023/Day1/multi-module-project]
$
```

```
jegan@tektutor: ~/devops-dec-2023/Day1/multi-module-project
[jegan@tektutor: ~/devops-dec-2023/Day1/multi-module-project] SUCCESS [ 0.024 s]
[INFO] main ..... SUCCESS [ 0.024 s]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 0.732 s
[INFO] Finished at: 2023-12-06T17:56:41+05:30
[INFO] -----
```

```
[jegan@tektutor.org)-[~/devops-dec-2023/Day1/multi-module-project]
$ mvn install
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO] -----
[INFO] Reactor Build Order:
[INFO]
[INFO] crm                               [pom]
[INFO] dal                               [jar]
[INFO] bl                                [jar]
[INFO] fe                                [jar]
[INFO] main                             [jar]
[INFO]
[INFO] -----< org.tektutor:crm >-----
[INFO] Building crm 1.0.0                  [1/5]
[INFO]   from pom.xml
[INFO] -----[ pom ]-----
[INFO]
[INFO] --- install:3.1.1:install (default-install) @ crm ---
[INFO] Installing /home/jegan/devops-dec-2023/Day1/multi-module-project/pom.xml to /home/jegan/.m2/repository/org/tektutor/crm/1.0.0/crm-1.0.0.pom
```

```
jegan@tektutor: ~/devops-dec-2023/Day1/multi-module-project
[jegan@tektutor: ~/devops-dec-2023/Day1/multi-module-project] jegan@tektutor: ~/devops-dec-2023
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0
[INFO]
[INFO]
[INFO] --- jar:3.3.0:jar (default-jar) @ main ---
[INFO] Building jar: /home/jegan/devops-dec-2023/Day1/multi-module-project/main/target/main-1.0.0.jar
[INFO]
[INFO] --- install:3.1.1:install (default-install) @ main ---
[INFO] Installing /home/jegan/devops-dec-2023/Day1/multi-module-project/main/pom.xml to /home/jegan/.m2/repository/org/tektutor/main/1.0.0/main-1.0.0.pom
[INFO] Installing /home/jegan/devops-dec-2023/Day1/multi-module-project/main/target/main-1.0.0.jar to /home/jegan/.m2/repository/org/tektutor/main/1.0.0/main-1.0.0.jar
[INFO]
[INFO] -----
[INFO] Reactor Summary for crm 1.0.0:
[INFO]
[INFO] crm ..... SUCCESS [ 0.131 s]
[INFO] dal ..... SUCCESS [ 1.243 s]
[INFO] bl ..... SUCCESS [ 0.308 s]
[INFO] fe ..... SUCCESS [ 0.271 s]
[INFO] main ..... SUCCESS [ 0.293 s]
[INFO]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO]
[INFO] Total time: 2.328 s
[INFO] Finished at: 2023-12-06T17:57:05+05:30
[INFO] -----
```

```
[jegan@tektutor.org)-[~/devops-dec-2023/Day1/multi-module-project]
$
```

The screenshot shows a terminal window with two tabs. The left tab displays the build log for a multi-module project, indicating a successful build with a total time of 2.328 seconds and a finish time of 2023-12-06T17:57:05+05:30. The right tab shows the command \$ mvn deploy being run.

```
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 2.328 s
[INFO] Finished at: 2023-12-06T17:57:05+05:30
[INFO] -----
[jegan@tektutor.org]-(~/devops-dec-2023/Day1/multi-module-project)
$ mvn deploy
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO] -----
[INFO] Reactor Build Order:
[INFO]
[INFO] crm                               [pom]
[INFO] dal                               [jar]
[INFO] bl                                [jar]
[INFO] fe                                [jar]
[INFO] main                             [jar]
[INFO]
[INFO] -----< org.tektutor:crm >-----
[INFO] Building crm 1.0.0                  [1/5]
[INFO]   from pom.xml
[INFO] -----[ pom ]-----
[INFO]
[INFO] --- install:3.1.1:install (default-install) @ crm ---
[INFO] Installing /home/jegan/devops-dec-2023/Day1/multi-module-project/pom.xml to /home/jegan/.m2/repository/org/tektutor/crm/1.0.0/crm-1.0.0.pom
[INFO]

[jegan@tektutor.org]-(~/devops-dec-2023/Day1/multi-module-project)
jegan@tektutor:~/devops-dec-2023/Day1/multi-module-project x | jegan@tektutor:~/devops-dec-2023
Uploading to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/main/1.0.0/main-1.0.0.pom
Uploaded to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/main/1.0.0/main-1.0.0.pom (421 B at 16 kB/s)
Uploading to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/main/1.0.0/main-1.0.0.jar
Uploaded to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/main/1.0.0/main-1.0.0.jar (2.0 kB at 82 kB/s)
Downloading from jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/main/maven-metadata.xml
Downloaded from jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/main/maven-metadata.xml (371 B at 62 kB/s)
Uploading to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/main/maven-metadata.xml
Uploaded to jfrog: http://localhost:8082/artifactory/tektutor/org/tektutor/main/maven-metadata.xml (323 B at 25 kB/s)
[INFO] -----
[INFO] Reactor Summary for crm 1.0.0:
[INFO]
[INFO] crm ..... SUCCESS [ 0.515 s]
[INFO] dal ..... SUCCESS [ 0.996 s]
[INFO] bl ..... SUCCESS [ 0.313 s]
[INFO] fe ..... SUCCESS [ 0.307 s]
[INFO] main ..... SUCCESS [ 0.295 s]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 2.519 s
[INFO] Finished at: 2023-12-06T17:57:28+05:30
[INFO] -----
```

Lab - Customizing maven to build a c++ project

```
cd ~/devops-dec-2023
git pull
cd Day1/cpp-project
mvn compile
mvn clean
mvn clean compile
```

Expected output

The screenshot shows a terminal window with two tabs. The active tab displays the output of a Maven command to compile a C++ project. The command run is `mvn compile`. The output shows the Maven build process, including scanning for projects, building the `hello-cpp` module from `pom.xml`, and executing a custom C++ compiler. It also shows the creation of a `bin` directory, compilation of source files, and the final `BUILD SUCCESS`. The total time taken for the build is 0.896 seconds, and it was completed at 2023-12-07T11:24:26+05:30. The second tab shows the directory listing with files `Makefile`, `pom.xml`, and `src`. The terminal prompt is `jegan@tektutor.org`.

```
(jegan@tektutor.org)-[~/devops-dec-2023/Day1/cpp-project]
$ mvn compile
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.tektutor:hello-cpp >-----
[INFO] Building hello-cpp 1.0
[INFO]   from pom.xml
[INFO] -----[ jar ]-----
[INFO]
[INFO] --- exec:3.1.1:exec (custom-cppCompile) @ hello-cpp ---
mkdir -p bin
g++ -c src/hello.cpp -o bin/hello.o
mkdir -p bin
g++ -c src/main.cpp -o bin/main.o
g++ bin/hello.o bin/main.o -lstdc++ -o bin/hello.exe
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time:  0.896 s
[INFO] Finished at: 2023-12-07T11:24:26+05:30
[INFO] -----
```

```
(jegan@tektutor.org)-[~/devops-dec-2023/Day1/cpp-project]
$ ls
bin  Makefile  pom.xml  src

(jegan@tektutor.org)-[~/devops-dec-2023/Day1/cpp-project]
```

```
jegan@tektutor:~/devops-dec-2023/Day1/cpp-project
(jegan@tektutor.org)-[~/devops-dec-2023/Day1/cpp-project]
$ ls
bin Makefile pom.xml src

(jegan@tektutor.org)-[~/devops-dec-2023/Day1/cpp-project]
$ mvn clean
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.tektutor:hello-cpp >-----
[INFO] Building hello-cpp 1.0
[INFO]   from pom.xml
[INFO] -----[ jar ]-----
[INFO]
[INFO] --- exec:3.1.1:exec (custom-clean) @ hello-cpp ---
rm -rf bin
[INFO]
[INFO] -----BUILD SUCCESS
[INFO]
[INFO] -----
[INFO] Total time: 0.301 s
[INFO] Finished at: 2023-12-07T11:24:36+05:30
[INFO]

(jegan@tektutor.org)-[~/devops-dec-2023/Day1/cpp-project]
$ ls
Makefile pom.xml src

(jegan@tektutor.org)-[~/devops-dec-2023/Day1/cpp-project]
$ mvn clean compile

jegan@tektutor:~/devops-dec-2023/Day1/cpp-project
(jegan@tektutor.org)-[~/devops-dec-2023/Day1/cpp-project]
$ mvn clean compile
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.tektutor:hello-cpp >-----
[INFO] Building hello-cpp 1.0
[INFO]   from pom.xml
[INFO] -----[ jar ]-----
[INFO]
[INFO] --- exec:3.1.1:exec (custom-clean) @ hello-cpp ---
rm -rf bin
[INFO]
[INFO] --- exec:3.1.1:exec (custom-cppCompile) @ hello-cpp ---
mkdir -p bin
g++ -c src/hello.cpp -o bin/hello.o
mkdir -p bin
g++ -c src/main.cpp -o bin/main.o
g++ bin/hello.o bin/main.o -lstdc++ -o bin/hello.exe
[INFO]
[INFO] -----BUILD SUCCESS
[INFO]
[INFO] -----
[INFO] Total time: 0.906 s
[INFO] Finished at: 2023-12-07T11:24:41+05:30
[INFO]

(jegan@tektutor.org)-[~/devops-dec-2023/Day1/cpp-project]
$ ls
bin Makefile pom.xml src
```