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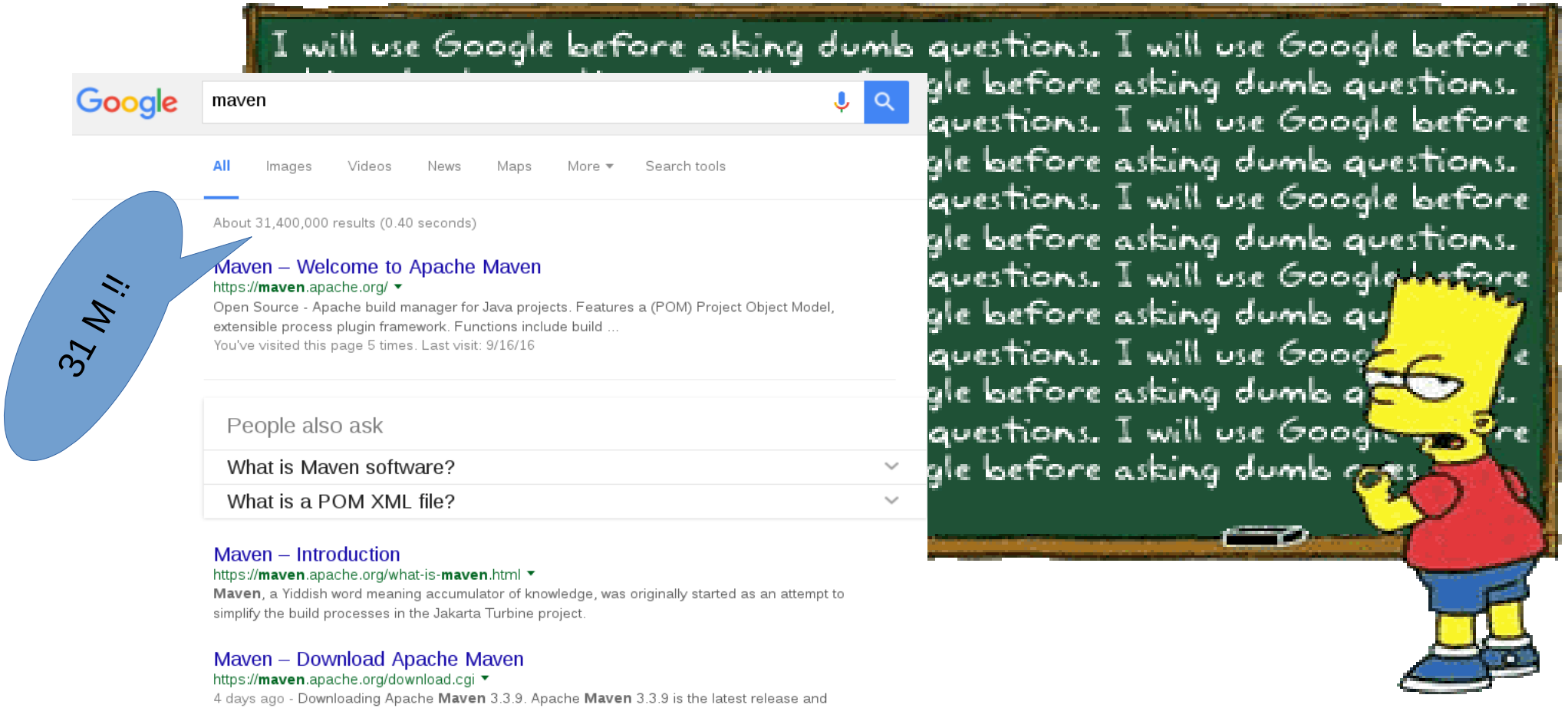
Maven

Introduction to Concepts:
POM, Dependencies, Plugins, Phases

This document:
http://arnaud-nauwynck.github.io/docs/Maven-Intro-Concepts.pdf

What is Maven ?



https://maven.apache.org/

Maven™

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Welcome to Apache Maven

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

If you think that Maven could help your project, you can find out more information about in the "About Maven" section of the navigation. This includes an in-depth description of what Maven is, a list of some of its main features, and a set of frequently asked questions about what Maven is.

This site is separated into the following sections, depending on how you'd like to use Maven:

Use	**Download, Install, Run Maven**	**Configure, Use Maven and Maven Plugins**
	Information for those needing to build a project that uses Maven	Information for those wanting to use Maven to build their project, including a "10 minute test" that gives a practical overview of Maven's main features in just 10 minutes and plugin list for more information on each plugin
Extend	**Write Maven Plugins**	**Improve the Maven Repository**
	Information for those who may or may not be using Maven, but want to provide a plugin for shared functionality or to accompany their own product or toolset	Information for those who may or may not use, but are interested in getting project metadata into the repository
Contribute	**Help Maven**	**Develop Maven**
	Information if you'd like to get involved: Maven is an open source community and welcomes contributions.	Information for those who are currently developers, or who are interested in contributing to the Maven project itself

A software project management and comprehension tool.

Based on a project object model (POM),
.. project's build, reporting and documentation..

https://maven.apache.org/guides/getting-started/maven-in-five-minutes.html

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

Maven™

Maven in 5 Minutes

Prerequisites

You must have an understanding of how to install software on your computer. If you do not know how to do this, please ask someone at your office, school, etc or pay someone to explain this to you. The Maven mailing lists are not the best place to ask for this advice.

Installation

Maven is a Java tool, so you must have Java installed in order to proceed.

First, download Maven and follow the installation instructions. After that, type the following in a terminal or in a command prompt:

```
1. mvn --version
```

It should print out your installed version of Maven, for example:

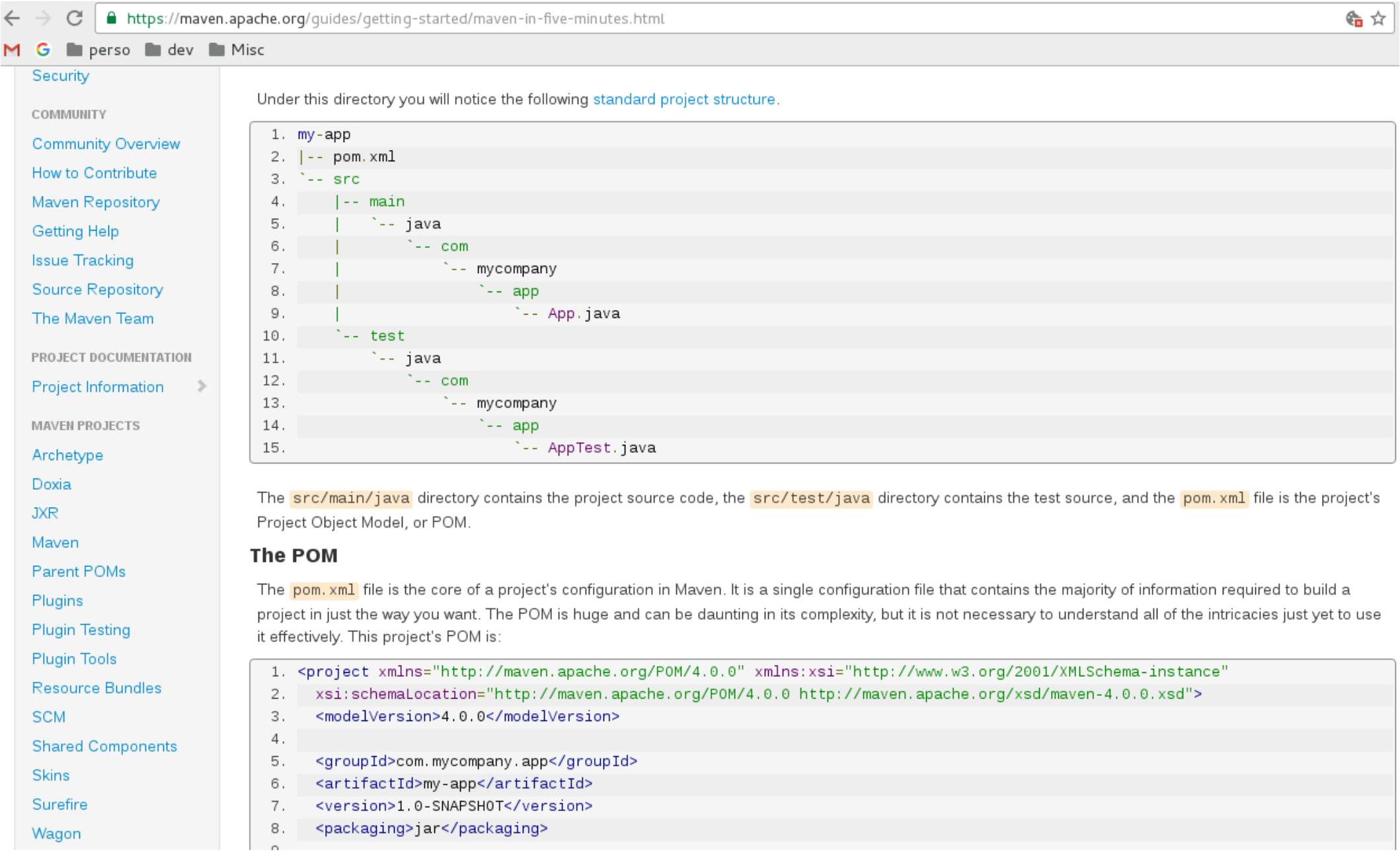
```
1. Apache Maven 3.0.5 (r01de14724cdef164cd33c7c8c2fe155faf9602da; 2013-02-19 14:51:28+0100)
2. Maven home: D:\apache-maven-3.0.5\bin\..
3. Java version: 1.6.0_25, vendor: Sun Microsystems Inc.
4. Java home: C:\Program Files\Java\jdk1.6.0_25\jre
5. Default locale: nl_NL, platform encoding: Cp1252
6. OS name: "windows 7", version: "6.1", arch: "amd64", family: "windows"
```

Depending upon your network setup, you may require extra configuration. Check out the Guide to Configuring Maven if necessary.

If you are using Windows, you should look at Windows Prerequisites to ensure that you are prepared to use Maven on Windows.

Creating a Project

https://maven.apache.org/guides/getting-started/maven-in-five-minutes.html



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Apache Maven

From Wikipedia, the free encyclopedia

This article has multiple issues. Please help **improve it** or discuss these issues on the **talk page**. *(Learn how and when to remove these template messages)* [hide]

- This article **may be too technical for most readers to understand**. *(October 2015)*
- This article **relies too much on references to primary sources**. *(October 2015)*
- This article **needs additional citations for verification**. *(March 2012)*

Maven is a build automation tool used primarily for Java projects. The word *maven* means "accumulator of knowledge" in Yiddish.[3] Maven addresses two aspects of building software: first, it describes how software is built, and second, it describes its dependencies. Contrary to preceding tools like Apache Ant, it uses conventions for the build procedure, and only exceptions need to be written down. An XML file describes the software project being built, its dependencies on other external modules and components, the build order, directories, and required plug-ins. It comes with pre-defined targets for performing certain well-defined tasks such as compilation of code and its packaging. Maven dynamically downloads Java libraries and Maven plug-ins from one or more repositories such as the Maven 2 Central Repository, and stores them in a local cache.[4] This local cache of downloaded artifacts can also be updated with artifacts created by local projects. Public repositories can also be updated.

Maven can also be used to build and manage projects written in C#, Ruby, Scala, and other languages. The Maven project is hosted by the Apache Software Foundation, where it was formerly part of the

Apache Maven

maven

Developer(s)	Apache Software Foundation
Initial release	13 July 2004; 12 years ago
Stable release	3.3.9[1] / 22 November 2015; 11 months ago[2]
Repository	git-wip-us.apache.org /repos/asf/maven.git
Development status	Active
Written in	Java
Operating system	Cross-platform
Type	Build tool
License	Apache License 2.0
Website	maven.apache.org

Maven is a Build Automation Tool

Contents [hide]

1 Example
2 Concepts
  2.1 Project Object Model
  2.2 Plugins
  2.3 Build lifecycles
  2.4 Dependencies
3 Maven compared with Ant
4 IDE integration

pom.xml

<dependencies>

<plugins>

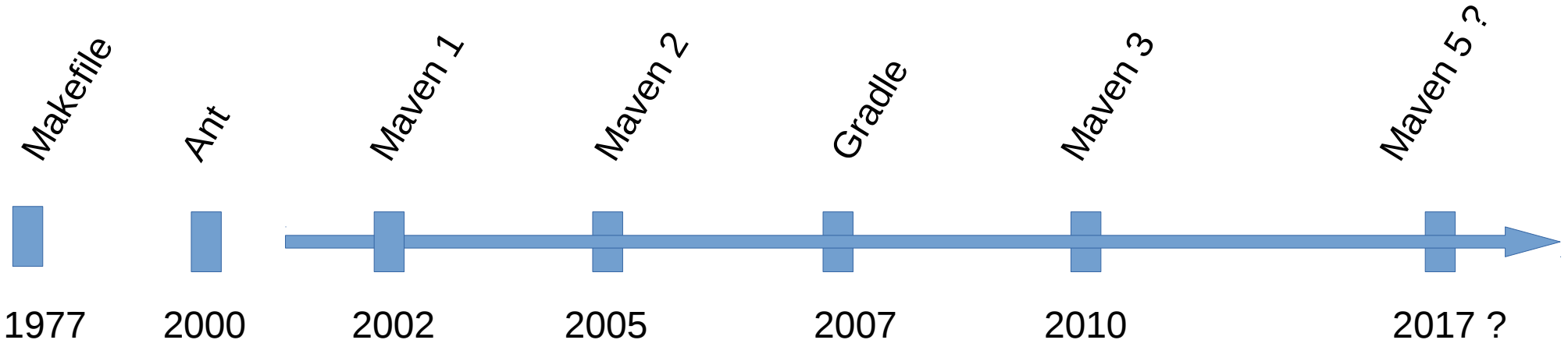
<packaging> <phase>

1st, it describes
how software is built,

2nd, it describes
its dependencies.

… use conventions for build

Maven History



Ant
= portable Make
in xml
for Javac, Jar, ..

Maven 1
= Ant + Jelly
= xml build tasks
+ scripts
(<if>, <var> ..)
+ rules / lifecycle…

Maven 2
= Java Mojo
pom.xml

Maven 3
= better & compatible

optional .mvnw
=> pom in
yaml, groovy, ..
(not widespread)

?? Split
pom vs build

Yaml / groovy

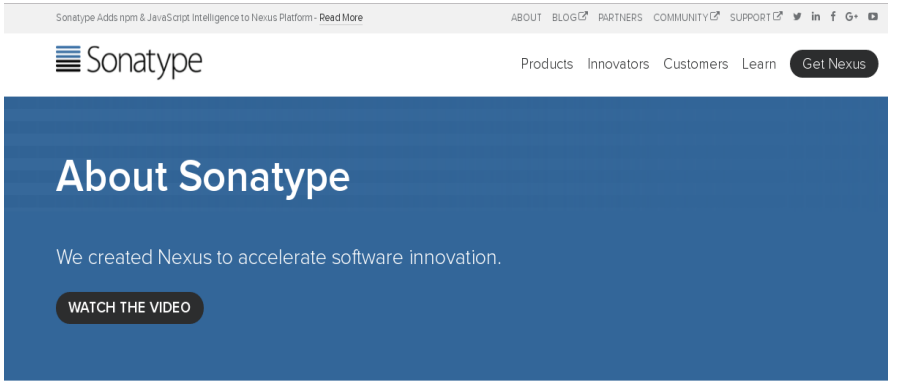
Authors, Company, Community

Jason Van Zyl

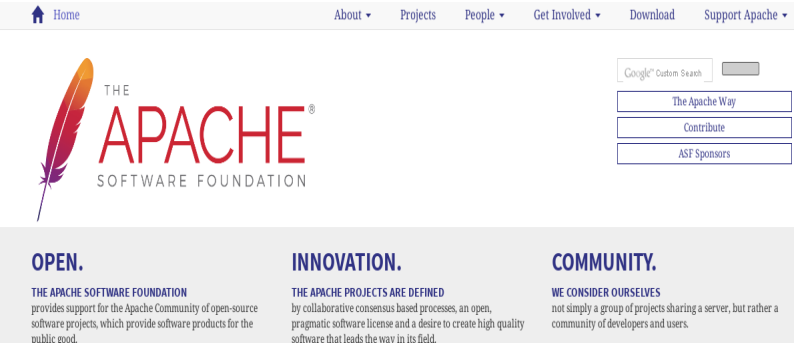
Worked on Turbine
Author of
- Velocity
- Maven

founder of Sonatype

Sonatype Company
(core Contributor + Product = Nexus)

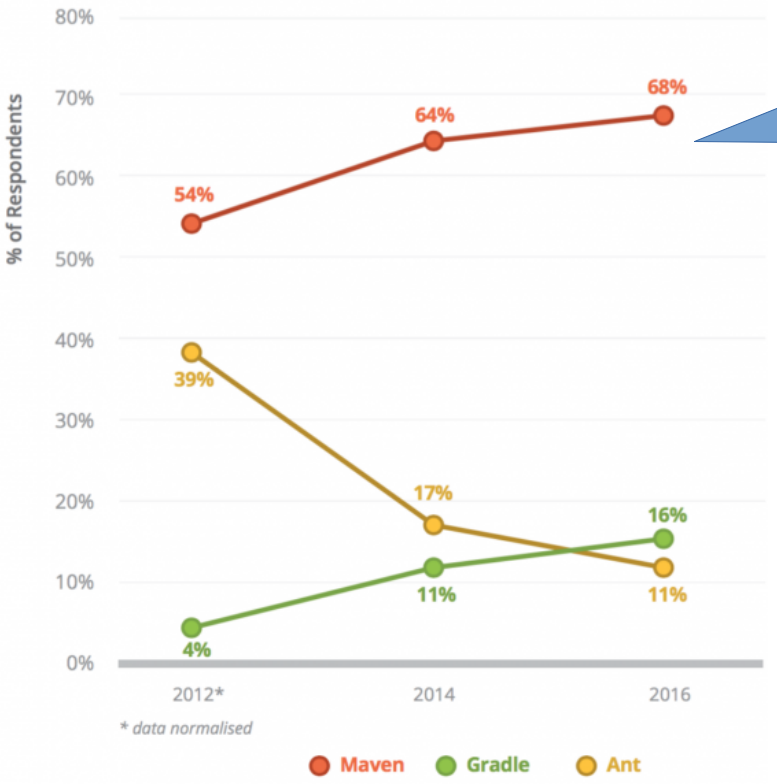


Apache Fondation
= Open Source Community

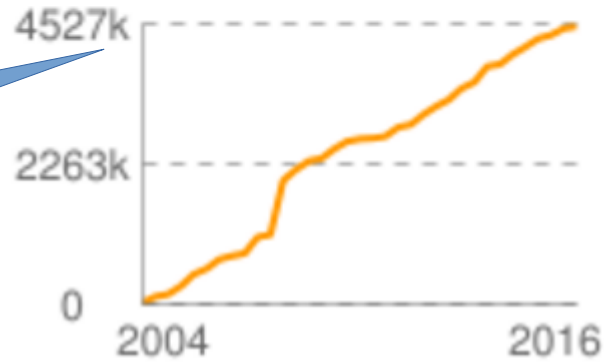


PMC Chair / Member / Contributor / Plugin-Developpers / Users

Maven Adoption



68% uses maven
It JUST Work !!



4.5 Millions published artifacts (=jars)

Yet Another Build Tool

Makefile, Imake, Cmake,
Ant, Maven, Gradle,
MsBuild, Sbt, Gulp, Grunt,
...

Declarative vs Imperative

Describe **WHAT** … not **HOW**

Imperative

Do **1/** This,
Then **2/** That,
Then **3/** Also That
...
And **N/** You have finished
you want to **restart** ?

Implicit
Convention over Configuration

Given standards

When You follow them

Then it just works

Implicit
Convention over Configuration

a Java Program is src/*.java files
compiled in classes/*.class
using javac + classpath

assembled in jar file

tested with Junit test
bla bla bla

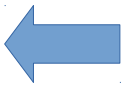
Implicit + Declarative = Surprising Magic ...

```xml
<project xmlns="http://maven.apache.org/POM/4.0.0"
  xsi:schemaLocation="http://maven.apache.org/POM/4
  <modelVersion>4.0.0</modelVersion>

  <groupId>fr.an.tests</groupId>
  <artifactId>test-mvn1</artifactId>
  <version>1.0-SNAPSHOT</version>

</project>
```


```
$ mvn install -o
[INFO] Scanning for projects..
[INFO] ------------------------
[INFO] Reactor Build Order:
[INFO]

[INFO] ------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------
[INFO] Total time: 1.219 s
[INFO] Finished at: 2016-11-05T
[INFO] Final Memory: 19M/348M
[INFO] ------------------------------------------------------------------------
```

Maven Core Concepts 1 : (declarative) **Project Object Model**

Contents [hide]



Mandatory GAV Declaration

Unique ID : GAV = Group / Artifact / Version

```
<groupId>fr.an.tests</groupId>
<artifactId>test-mvn</artifactId>
<version>1.0-SNAPSHOT</version>
```

Group = like dns domain name, reverse

com.<<company>>, org.<<...>>, <<country>>.<<...>>. ...

Artifact = name of the final jar

naming convention: some-library-name

Version = major.minor.fix (-SNAPSHOT)?

Optional Project Information

```
<!-- More Project Information -->
<name>...</name>
<description>...</description>
<url>...</url>
<inceptionYear>...</inceptionYear>
<licenses>...</licenses>
<organization>...</organization>
<developers>...</developers>
<contributors>...</contributors>

<!-- Environment Settings -->
<issueManagement>...</issueManagement>
<ciManagement>...</ciManagement>
<mailingLists>...</mailingLists>
<scm>...</scm>
<prerequisites>...</prerequisites>
<repositories>...</repositories>
<pluginRepositories>...</pluginRepositories>
<distributionManagement>...</distributionManagement>
<profiles>...</profiles>
```

Example Project Information

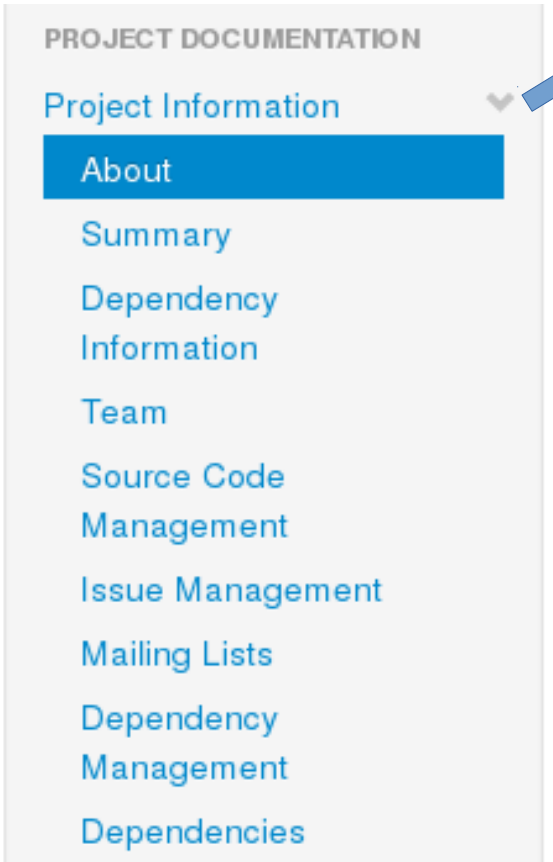
```
<artifactId>maven-jar-plugin</artifactId>
<version>3.0.2</version>
<packaging>maven-plugin</packaging>

<name>Apache Maven JAR Plugin</name>
<description>Builds a Java Archive (JAR) file from the compiled pro

<contributors>
  <contributor>
    <name>Jerome Lacoste</name>
    <email>jerome@coffeebreaks.org</email>
    <organization>CoffeeBreaks</organization>
    <organizationUrl>http://www.coffeebreaks.org</organizationUrl>
    <timezone>+1</timezone>
    <roles>
      <role>Java Developer</role>
    </roles>
  </contributor>
</contributors>

<prerequisites>
  <maven>${mavenVersion}</maven>
</prerequisites>

<scm>
  <connection>scm:svn:http://svn.apache.org/repos/asf/maven/plugins
```

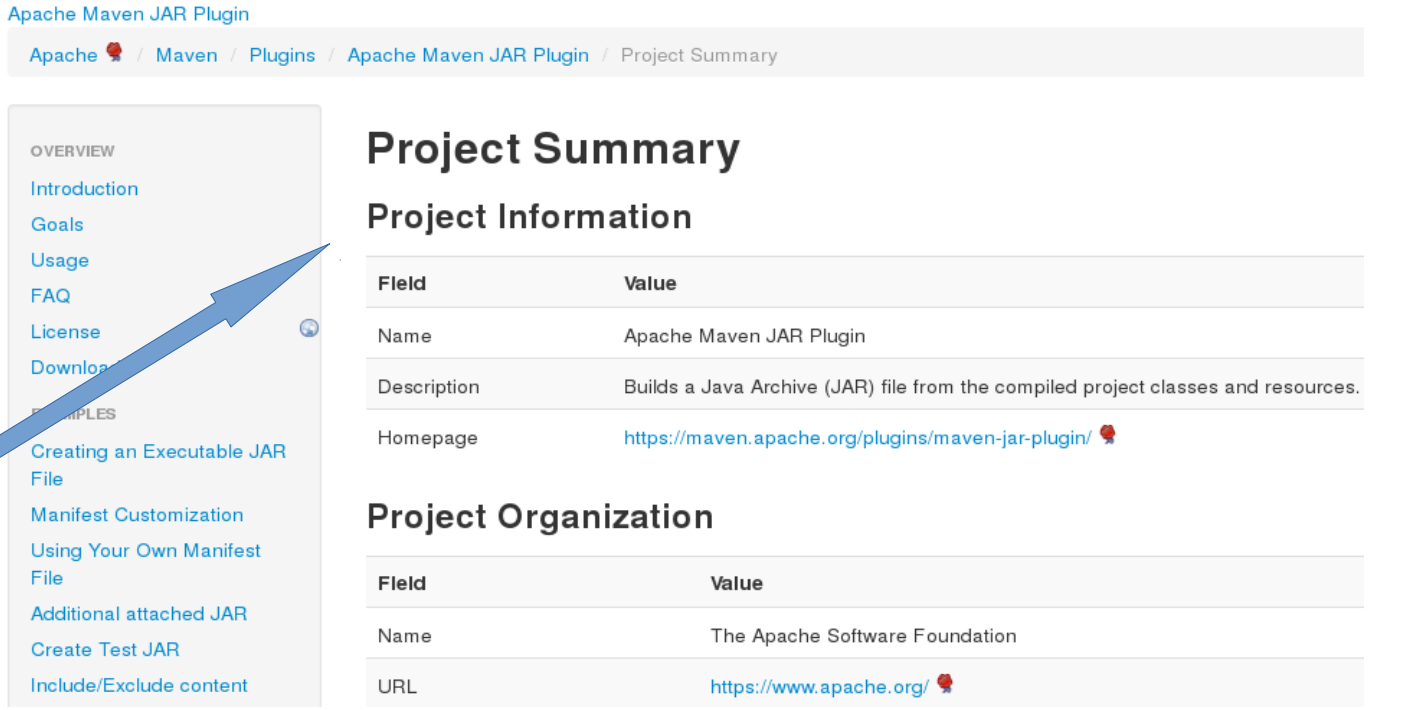
Typical Maven Generated Site

Then you recognise pom infos

Menu when you see this logo

Logo comes from maven (maven-site-plugin)





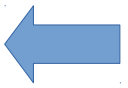
Basic Declarations

```
<!-- The Basics -->
<parent>...</parent>
<packaging>jar</packaging> <!-- implicit: jar -->

<dependencies>
   <dependency>...</dependency>
</dependencies>
<dependencyManagement>...</dependencyManagement>

<modules>
   <module>...</module>
</modules>
<properties>...</properties>

<!-- Build Settings -->
<build>
    <plugins>
       <plugin>...</plugin>
    </plugins>
</build>
<reporting>...</reporting>
```

WIKIPEDIA
The Free Encyclopedia

Maven Core Concepts 2 : **Dependencies**

Contents [hide]



Dependency Declaration

Describe WHAT

```
<dependency>
  <groupId>junit</groupId>
  <artifactId>junit</artifactId>
  <version>4.12</version>
  <scope>test</scope>
</dependency>
```

Not HOW

```
$ mvn install
[INFO] Scanning for projects...
[INFO]
```

First execution:
Download

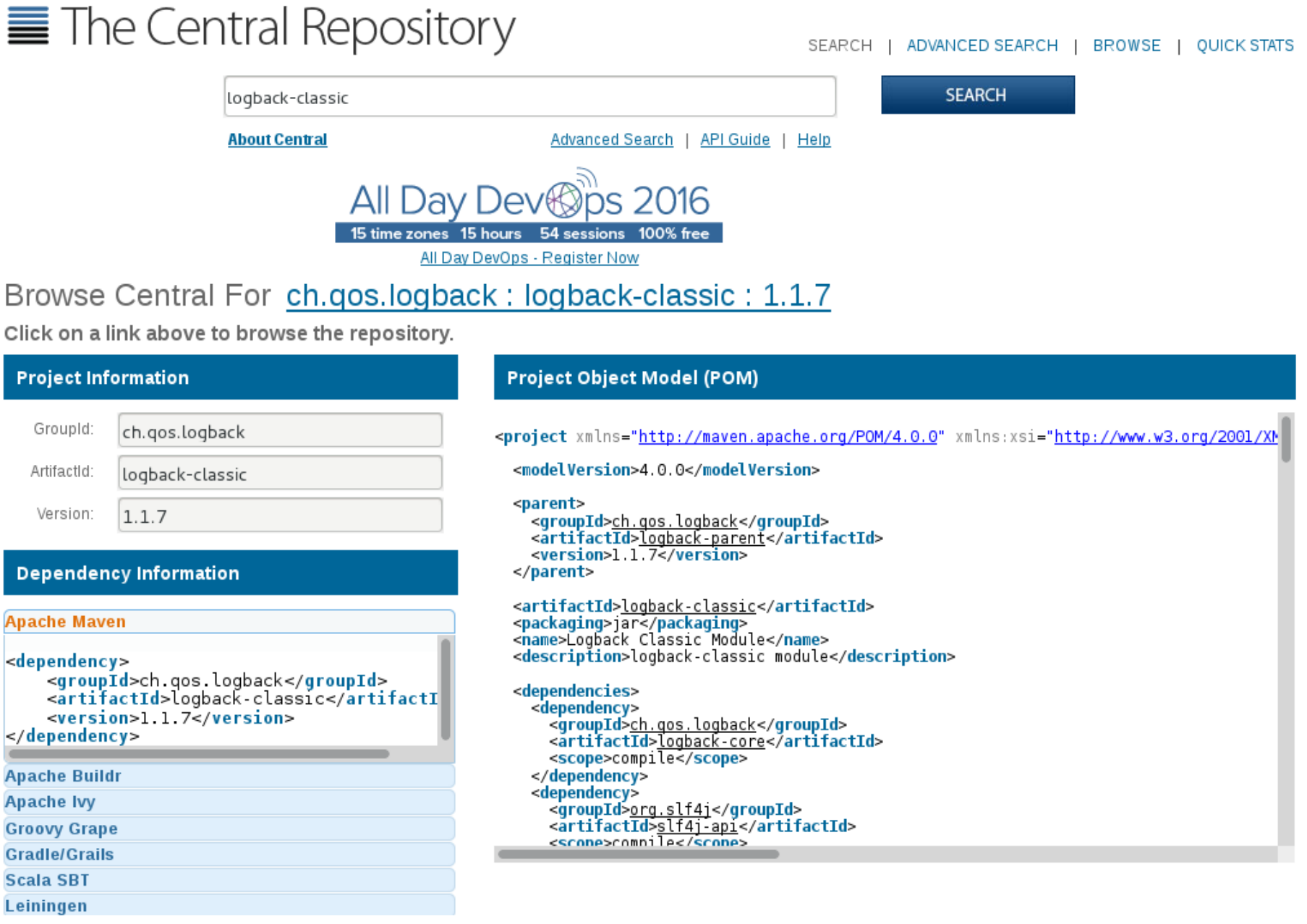
Next execution:
reuse local repository file

```
[INFO] ------------------------------------------------------------------------
Downloading: https://oss.sonatype.org/content/repositories/releases/junit/junit/4.12/junit-4.12.jar
Downloaded: https://oss.sonatype.org/content/repositories/releases/junit/junit/4.12/junit-4.12.jar (308 KB at 150.9 KB/sec)
[INFO]
```

```
/home/arnaud/.m2/repository
$ ls -l junit/junit/4.12/
total 348
-rw-r--r-- 1 arnaud arnaud 314932 Nov  6 12:35 junit-4.12.jar
-rw-r--r-- 1 arnaud arnaud     40 Nov  6 12:35 junit-4.12.jar.sha1
-rw-r--r-- 1 arnaud arnaud  23678 Feb 18  2016 junit-4.12.pom
-rw-r--r-- 1 arnaud arnaud     40 Feb 18  2016 junit-4.12.pom.sha1
-rw-r--r-- 1 arnaud arnaud    648 Nov  2 00:15 m2e-lastUpdated.properties
-rw-r--r-- 1 arnaud arnaud    348 Nov  6 12:35 _remote.repositories
```

WHERE ?

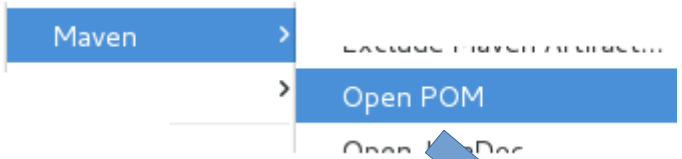
http://maven.search.org



Transitive Dependencies

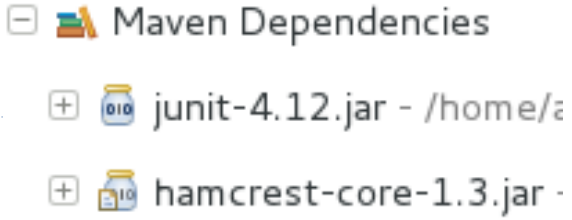
```
<dependency>
  <groupId>junit</groupId>
  <artifactId>junit</artifactId>
  <version>4.12</version>
  <scope>test</scope>
</dependency>
```

Transitive Relation Definition:
A → B and B → C .. then A → C



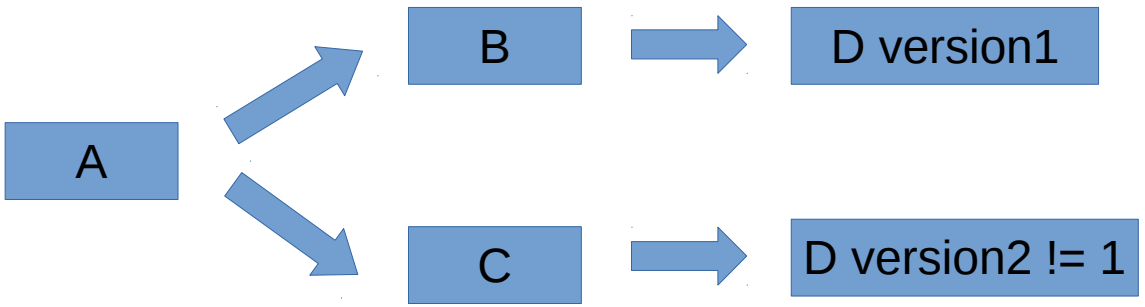
junit:junit:4.12.pom

```
<dependencies>
    <dependency>
        <groupId>org.hamcrest</groupId>
        <artifactId>hamcrest-core</artifactId>
        <version>1.3</version>
    </dependency>
</dependencies>
```



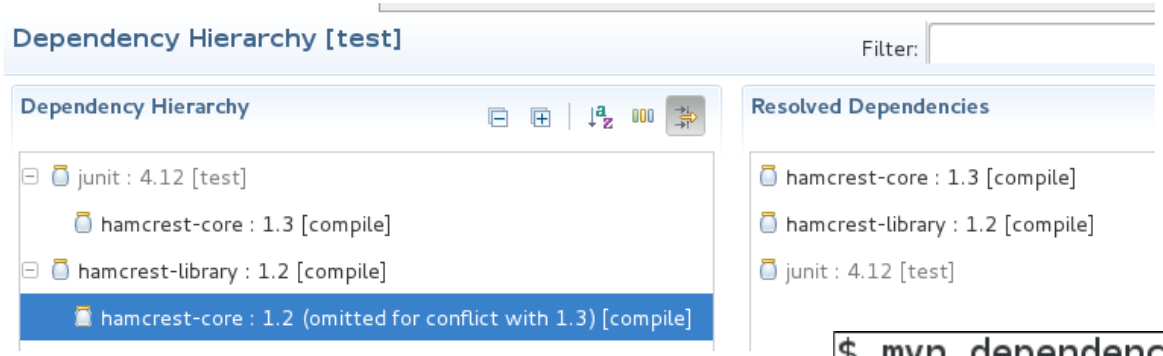
Transitive Dependencies Conflicts

```
<dependency>
  <groupId>junit</groupId>
  <artifactId>junit</artifactId>
  <version>4.12</version> <!-- ==> dependendency hamcrest-core:1.3 -->
  <scope>test</scope>
</dependency>

<dependency>
    <groupId>org.hamcrest</groupId>
    <artifactId>hamcrest-library</artifactId>
    <version>1.2</version> <!-- ==> dependendency hamcrest-core:1.2 -->
</dependency>
```



Dependencies Omitted for Conflict

Given Java ClassLoader load once each class
When you have conflict
Then 1 jar on 2 would be useless,
Maven omit oldest jar version

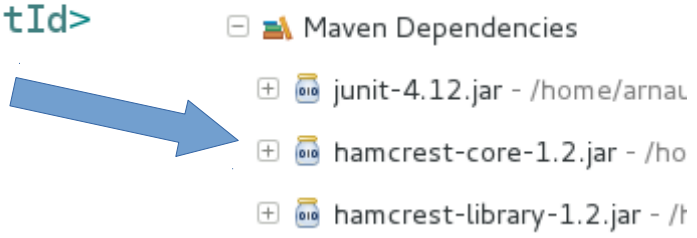



```
$ mvn dependency:tree

[INFO] --- maven-dependency-plugin:2.8:tree (default-cl
[INFO] fr.an.tests:test-mvn-archetype1:jar:1.0-SNAPSHOT
[INFO] +- junit:junit:jar:4.12:test
[INFO] |  \- org.hamcrest:hamcrest-core:jar:1.3:compile
[INFO] \- org.hamcrest:hamcrest-library:jar:1.2:compile
```

Can Override default configuration

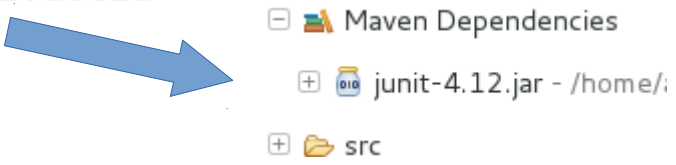
```
<dependencyManagement>
  <dependencies>
    <dependency>
      <groupId>org.hamcrest</groupId>
      <artifactId>hamcrest-core</artifactId>
      <version>1.2</version>
  </dependency>
  </dependencies>
</dependencyManagement>
```

Override to use specific version



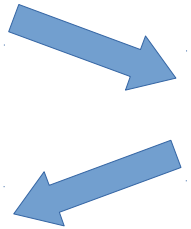

```
<dependencies>
  <dependency>
    <groupId>junit</groupId>
    <artifactId>junit</artifactId>
    <version>4.12</version>
    <scope>test</scope>
    <exclusions>
      <exclusion>
        <groupId>org.hamcrest</groupId>
        <artifactId>hamcrest-core</artifactId>
      </exclusion>
    </exclusions>
  </dependency>
</dependencies>
```

Override to exclude dependency



DependencyManagement
avoid duplicate version, use parent

```
<dependencyManagement>
  <dependencies>
      <dependency>
```



```
<dependencies>
  <dependency>
    <groupId>junit</groupId>
    <artifactId>junit</artifactId>
    <scope>test</scope>
    <version>4.12</version>
  </
</de
```

Duplicating managed version 4.12 for junit

2 quick fixes available:

Remove version declaration

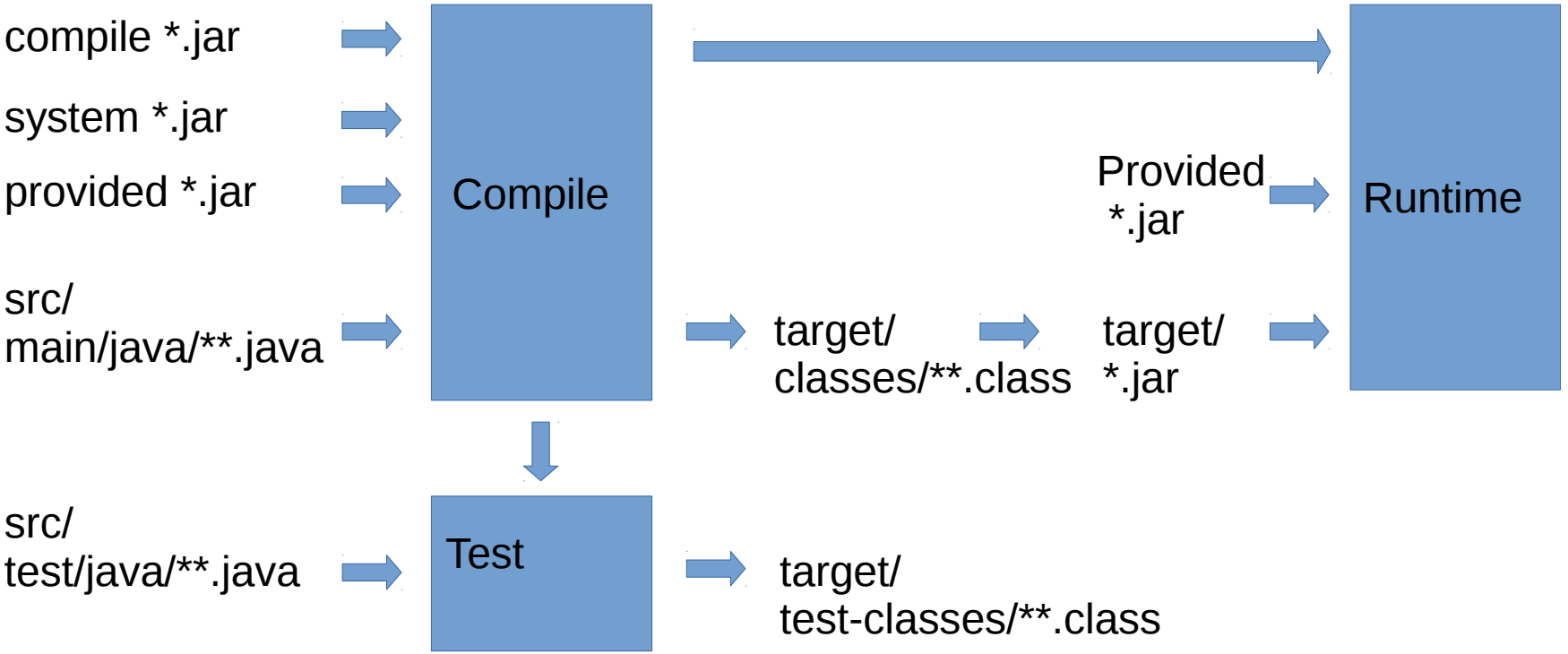
Ignore this warning

Press 'F2' for focus

```
<dependency>
  <groupId>junit</groupId>
  <artifactId>junit</artifactId>
  <scope>test</scope>
</dependency>
```

Dependency Scopes

```
<scope>compile</scope>  <!-- default -->
<scope>runtime</scope>  <!-- at RT, not compile-time (ex: ojdbc16.jar) -
<scope>provided</scope> <!-- should be on server (ex: servlet.jar) -->
<scope>system</scope>   <!-- should be in system (ex: <<jdk>>/tools.jar)
<scope>test</scope>     <!-- only for src/test/java, not src/main -->
<scope>import</scope>   <!-- for dependencyManagement -->
```



Dependency Summary

Would be more concise than xml:
“junit:junit:4.12:test”

Use dependencyManagement
versions in parent only

don't be too verbose
transitive dependencies => implicit

don't be too implicit
use exact versions, not *

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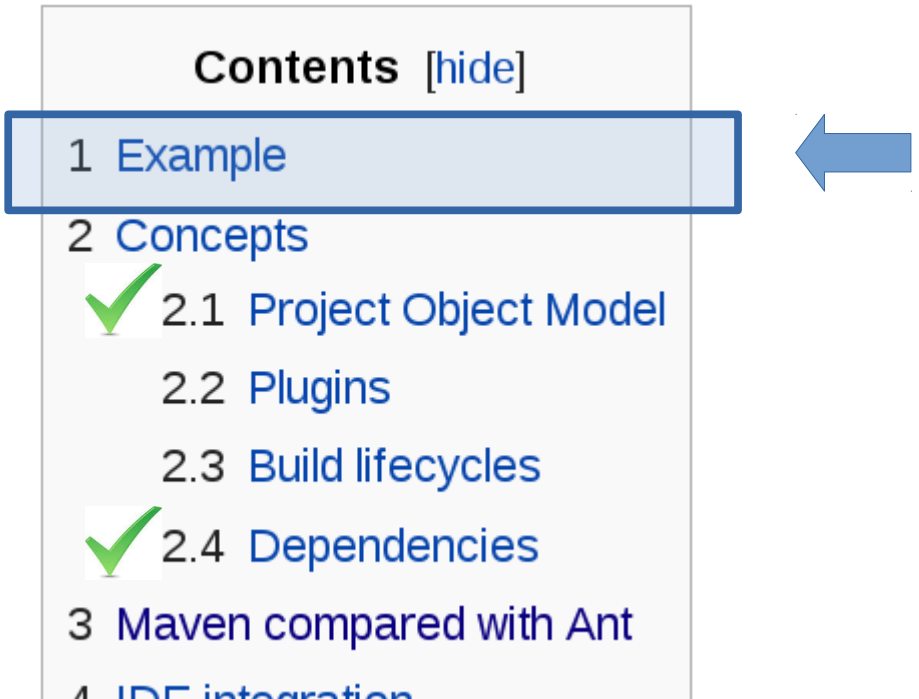
Example
Getting Started with Mvn & Eclipse



Maven Tools Usages

In Command Line

In IDE Eclipse
Buit-in support

In CI Server Jenkins..
Built-in support

```
$
$ mvn
```

Maven Tools Usages

In Command Line

In IDE Eclipse
Buit-in support

In CI Server Jenkins..
Built-in support

```
$
$ mvn
```

Installation= Unzip + export PATH

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

Maven™

Apache / Maven / Installing Apache Maven — Last Published: 2016-11-04

MAIN
- Welcome
- License
- Download
- Install
- Configure
- Run
- IDE Integration

ABOUT MAVEN
- What is Maven?
- Features

Installing Apache Maven

The installation of Apache Maven is a simple process of extracting the archive and adding the `bin` folder with the `mvn` command to the `PATH`.

Detailed steps are:

- Ensure `JAVA_HOME` environment variable is set and points to your JDK installation
- Extract distribution archive in any directory

1: Unzip

```
1. unzip apache-maven-3.3.9-bin.zip
```

or

```
1. tar xzvf apache-maven-3.3.9-bin.tar.gz
```

Unix-based Operating System (Linux, S

- Check environment variable value

```
1. echo $JAVA_HOME
2. /Library/Java/JavaVirtualMachines/jdk1.8.0_45.jdk/Contents/Home
```

2: export JAVA_HOME & PATH

- Adding to `PATH`

```
1. export PATH=/opt/apache-maven-3.3.9/bin:$PATH
```

Mvn command line

```
$ mvn --version
Apache Maven 3.3.9
Maven home: /opt/de
```

```
$ mvn --help

usage: mvn [options] [<goal(s)>] [<phase(s)>]

Options:
```

```
$ mvn install -o
[INFO] Scanning for projects...
[INFO] ------------------------------------------------------------------------
[INFO] Reactor Build Order:
[INFO]
```

mvn install

```
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 1.219 s
[INFO] Finished at: 2016-11-05T18:18:01+01:00
[INFO] Final Memory: 19M/348M
[INFO] ------------------------------------------------------------------------
```

Typical Commands

Simple phases

```
mvn clean install
```

With options

```
mvn install -f ../pom.xml
 -o -DskipTests -Pprofile...
```

Plugin Goals

```
mvn springboot:run
```

Start Edit a Pom.xml manually ?

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

  <groupId>fr.an.tests</groupId>
  <artifactId>test-mvn1</artifactId>
  <version>1.0-SNAPSHOT</version>

</project>
```

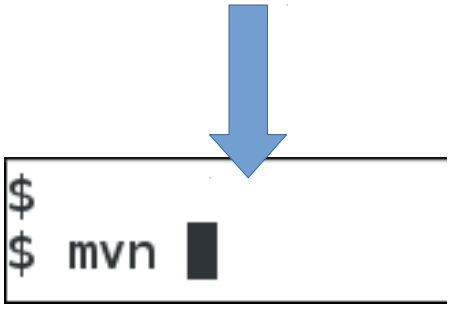
XML = Langage for Computers
… not for Humans

You only need this identity card :
GAV = group / artifact / version

New Maven Project

Copy & Paste

mvn install

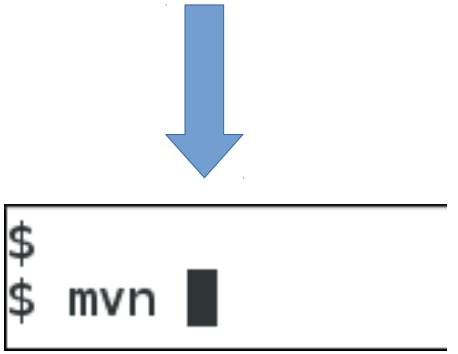


mvn archetype:generate

mvn install

New Project... >
Type: Maven Project

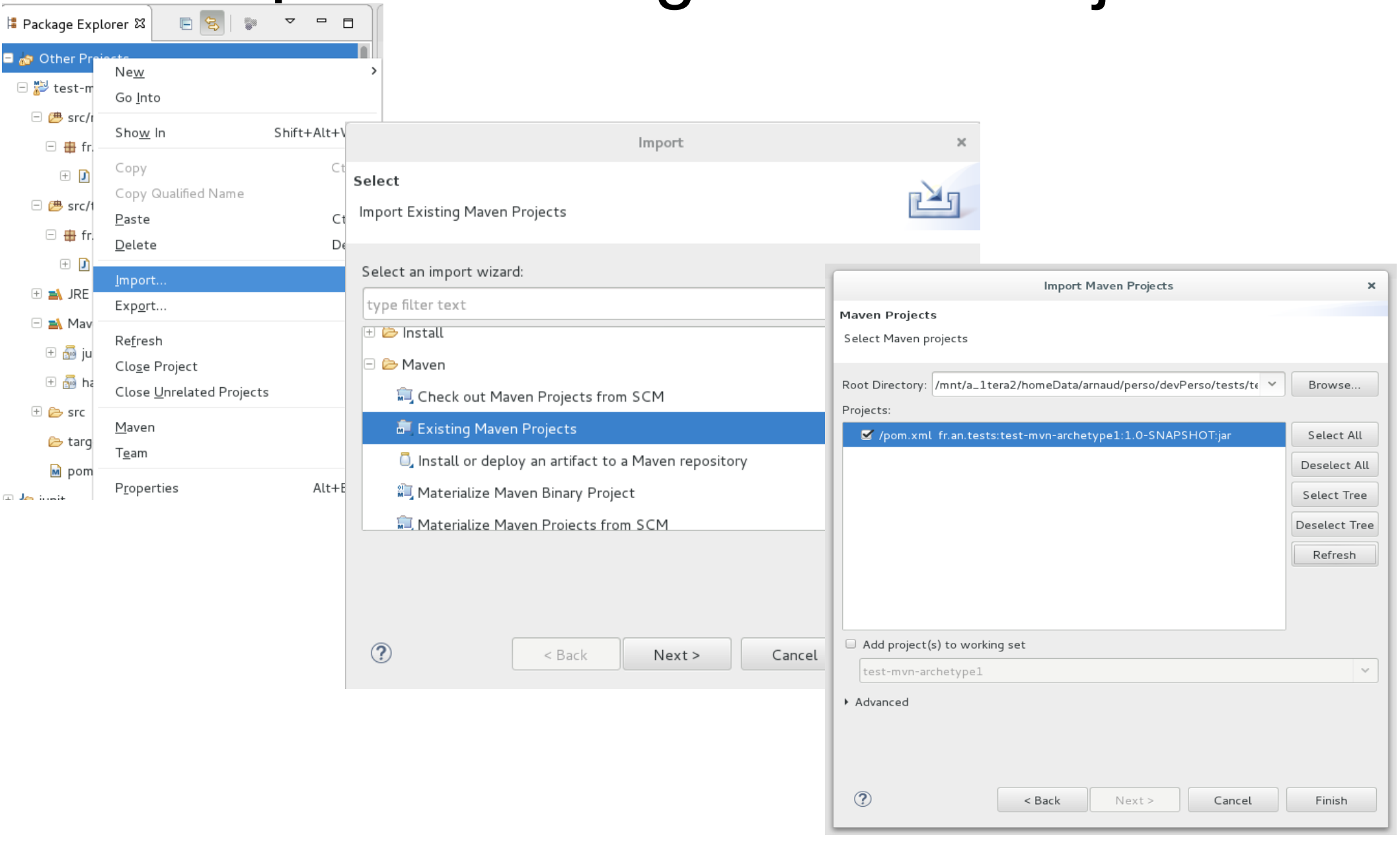
Choose archetype...



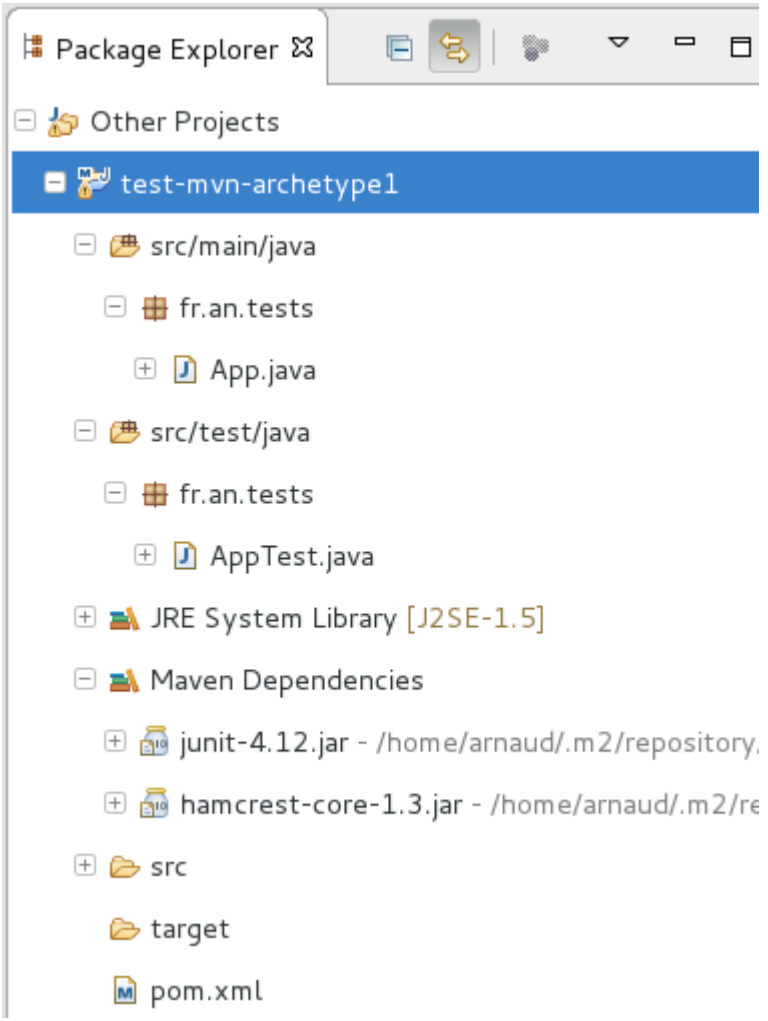
mvn install

Import existing project … >
Type : maven

Eclipse
Import Existing Maven Project



First Maven Project in Eclipse



Pom.xml

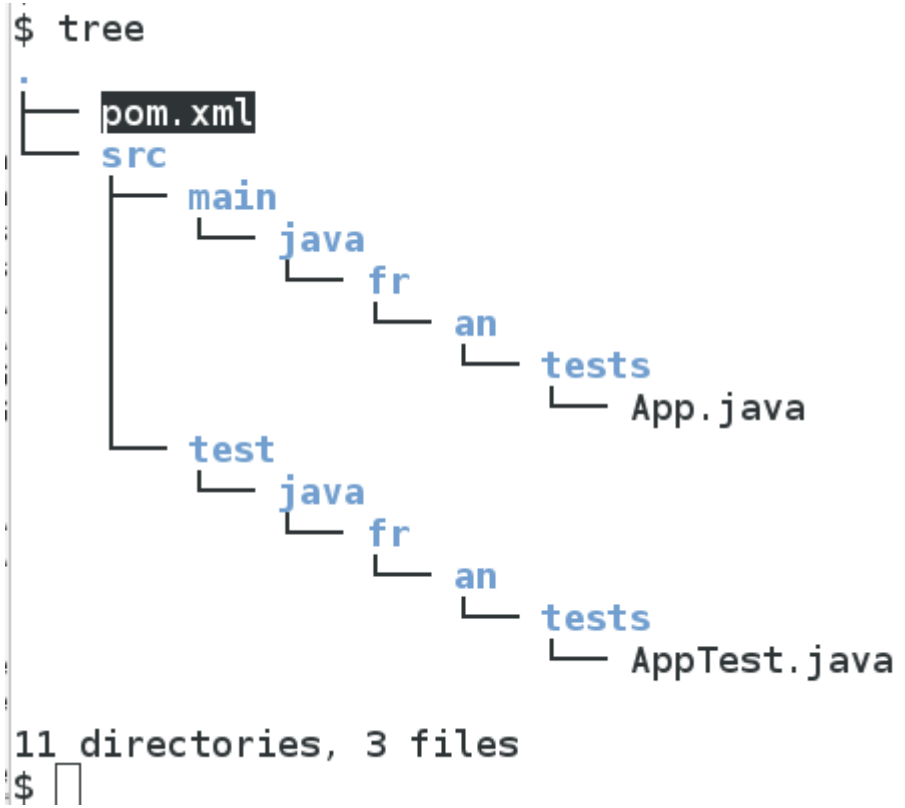
```xml
<project xmlns="http://maven.apache.org/POM/4.0.0"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
                      http://maven.apache.org/xsd/maven-4.0.0.xsd">
  <modelVersion>4.0.0</modelVersion>

  <groupId>fr.an.tests</groupId>
  <artifactId>test-mvn1</artifactId>
  <version>1.0-SNAPSHOT</version>
  <packaging>jar</packaging>

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

</project>
```

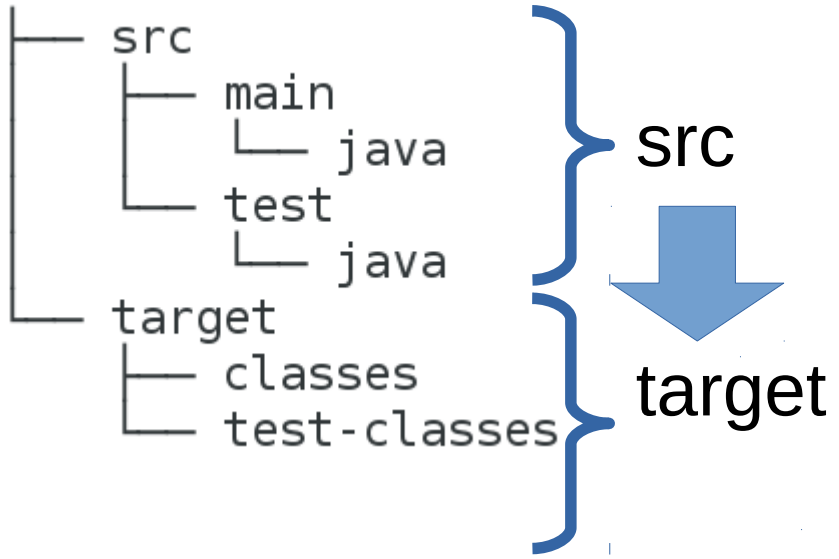
Standard Source Project Layout



Mvn compile (or install)

```
$ mvn install
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building test-mvn1 1.0-SNAPSHOT
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- maven-resources-plugin:2.6:resources (default-resources) @ test-mvn1 ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory /mnt/a_1tera2/homeData/arnaud/perso/devPerso/tests/test-mvn-archetype1/src/main/re
sources
[INFO]
[INFO] --- maven-compiler-plugin:3.1:compile (default-compile) @ test-mvn1 ---
[INFO] Changes detected - recompiling the module!
[WARNING] File encoding has not been set, using platform encoding UTF-8, i.e. build is platform dependent!
[INFO] Compiling 1 source file to /mnt/a_1tera2/homeData/arnaud/perso/devPerso/tests/test-mvn-archetype1/target/classes
[INFO]
[INFO] --- maven-resources-plugin:2.6:testResources (default-testResources) @ test-mvn1 ---
[WARNING] Using platform encoding (UTF-8 actually) to copy filtered resources, i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory /mnt/a_1tera2/homeData/arnaud/perso/devPerso/tests/test-mvn-archetype1/src/test/re
sources
[INFO]
[INFO] --- maven-compiler-plugin:3.1:testCompile (default-testCompile) @ test-mvn1 ---
[INFO] Changes detected - recompiling the module!
[WARNING] File encoding has not been set, using platform encoding UTF-8, i.e. build is platform dependent!
[INFO] Compiling 1 source file to /mnt/a_1tera2/homeData/arnaud/perso/devPerso/tests/test-mvn-archetype1/target/test-classes
[INFO]
[INFO] --- maven-surefire-plugin:2.12.4:test (default-test) @ test-mvn1 ---
[INFO] Tests are skipped.
[INFO]
[INFO] --- maven-jar-plugin:2.4:jar (default-jar) @ test-mvn1 ---
[INFO] Building jar: /mnt/a_1tera2/homeData/arnaud/perso/devPerso/tests/test-mvn-archetype1/target/test-mvn1-1.0-SNAPSHOT.jar
[INFO]
[INFO] --- maven-install-plugin:2.4:install (default-install) @ test-mvn1 ---
[INFO] Installing /mnt/a_1tera2/homeData/arnaud/perso/devPerso/tests/test-mvn-archetype1/target/test-mvn1-1.0-SNAPSHOT.jar to
 /home/arnaud/.m2/repository/fr/an/tests/test-mvn1/1.0-SNAPSHOT/test-mvn1-1.0-SNAPSHOT.jar
[INFO] Installing /mnt/a_1tera2/homeData/arnaud/perso/devPerso/tests/test-mvn-archetype1/pom.xml to /home/arnaud/.m2/reposito
ry/fr/an/tests/test-mvn1/1.0-SNAPSHOT/test-mvn1-1.0-SNAPSHOT.pom
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
```

src → target directories



compile

src/main/java → target/classes

compile-test

src/test/java → target/test-classes

jar

target/classes → target/*.jar

install

target/*.jar → ~/.m2/repository/...
groupId/artifactid/version/*.jar

deploy

.m2/repository/.. .jar → http://nexus-repo/...
groupId/artifactid/version/*.jar

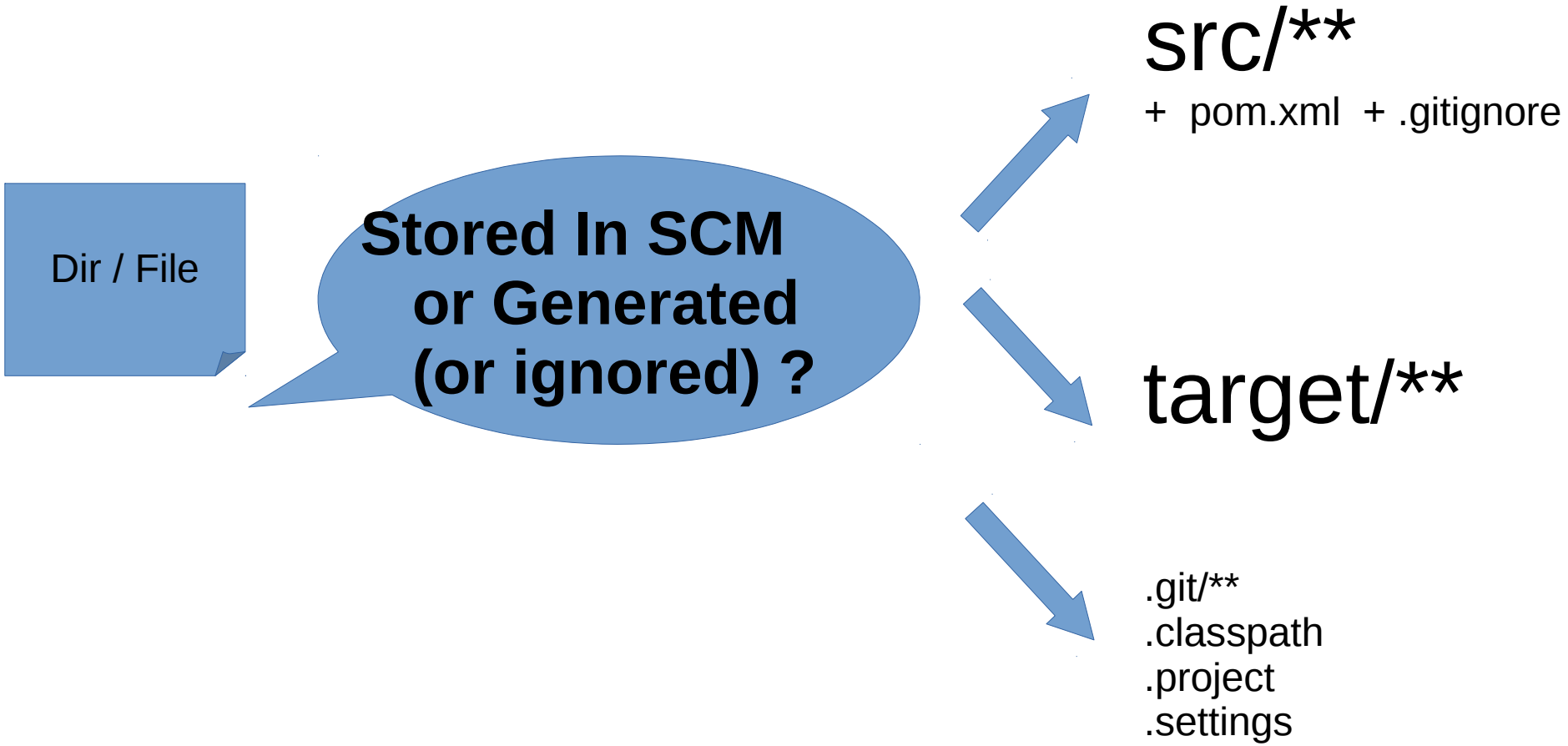
Mvn clean
src vs target + .gitignore

```
$ mvn clean
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building test-mvn1 1.0-SNAPSHOT
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- maven-clean-plugin:2.5:clean (default-clean) @ test-mvn1 ---
[INFO] Deleting /mnt/a_1tera2/homeData/arnaud/perso/devPerso/tests/test-mvn-archetype1/target
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 0.223 s
[INFO] Finished at: 2016-11-06T18:58:30+01:00
[INFO] Final Memory: 6M/283M
[INFO] ------------------------------------------------------------------------
```

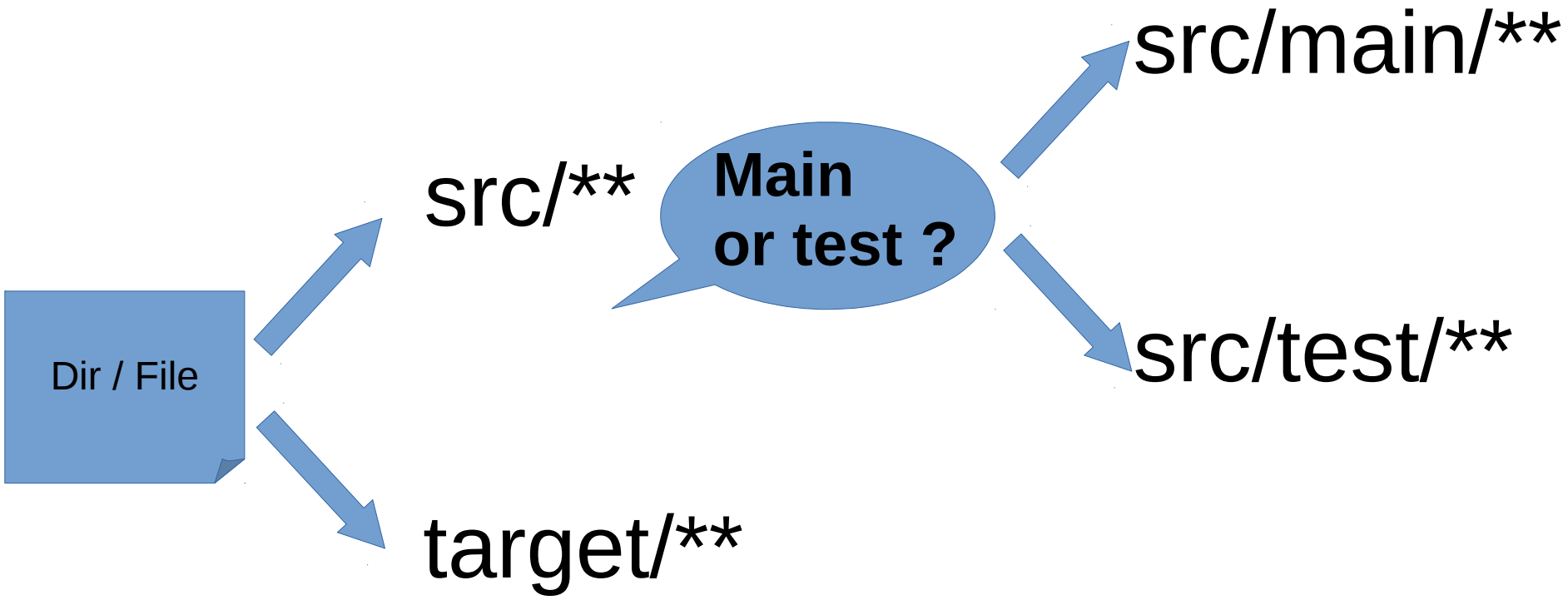
Typical .gitignore for target/, .project, .classpath, ...

```
$ ls
pom.xml  src  target
$
$ ls -a
.  ..  .classpath  .git  .gitignore  pom.xml  .project  .settings  src  target
$
$ cat .gitignore
target
.project
.classpath
.settings
```

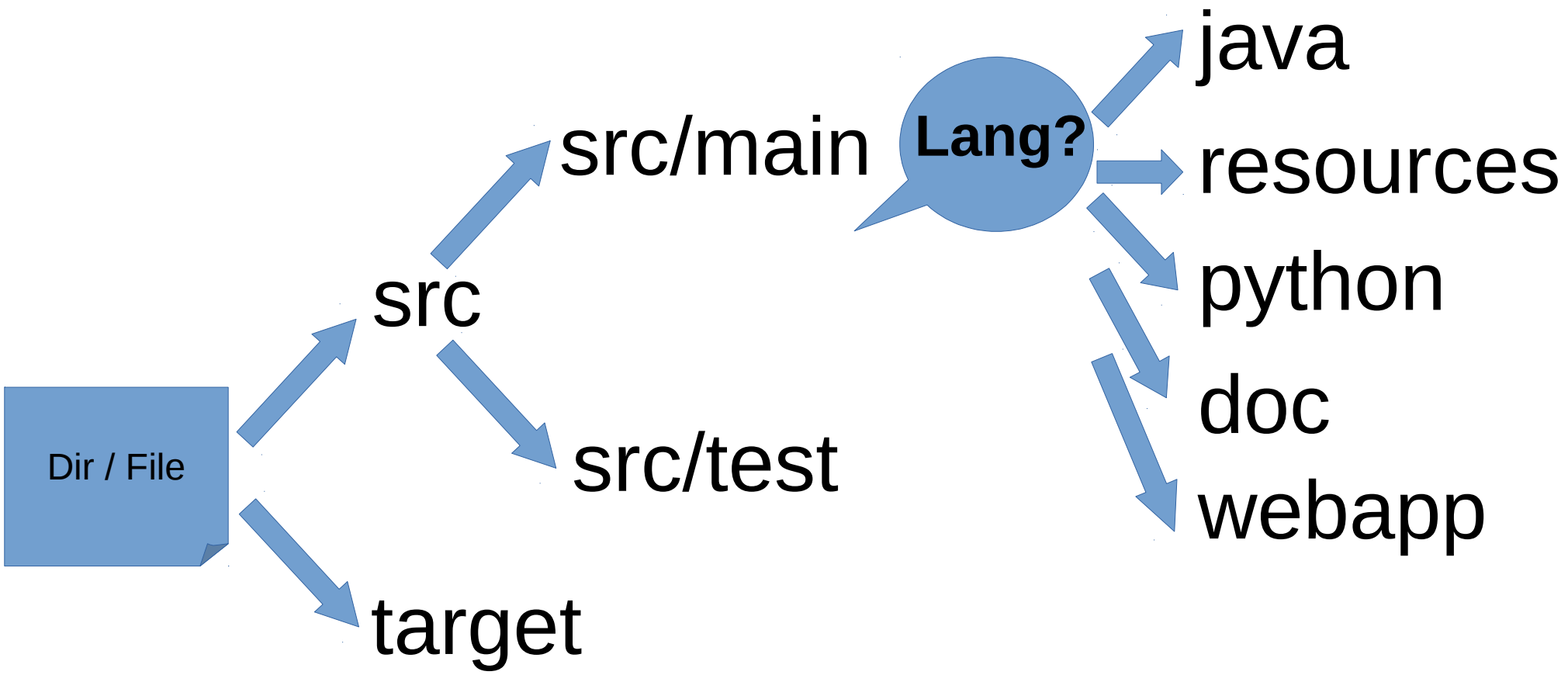
Project Layout Explained by Dichotomy Questions



Project Layout Explained (bis)



Project Layout Explained (ter)



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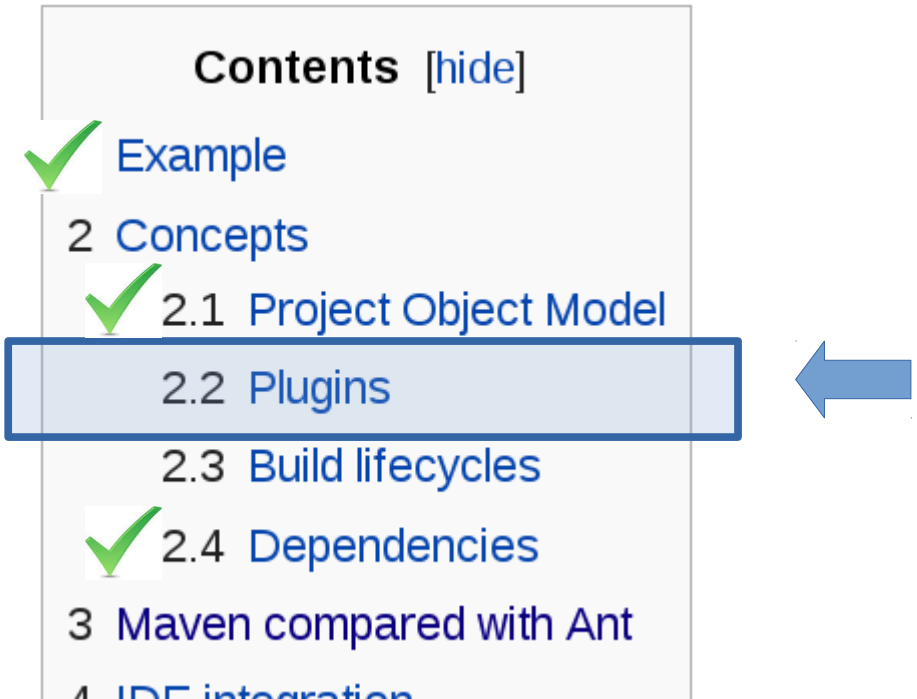
The Free Encyclopedia

Maven Core Concepts 3 : Plugins – Goals



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

MAIN
Welcome
License
Download
Install
Configure
Run
IDE Integration

ABOUT MAVEN
What is Maven?
Features
FAQ
Support and Training

DOCUMENTATION
Maven Plugins
Index (category)
Running Maven
User Centre
Plugin Developer Centre
Maven Repository Centre
Maven Developer Centre
Books and Resources
Security

COMMUNITY
Community Overview
How to Contribute
Maven Repository
Getting Help

Available Plugins

Scroll for 100 more

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

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

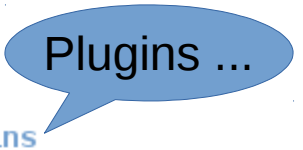
Supported By The Maven Project

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

Plugin	Type*	Version	Release Date	Description	Source Repository	Issue Tracking
Core plugins				**Plugins corresponding to default core phases (ie. clean, compile). They may have multiple goals as well.**		
`clean`	B	3.0.0	2015-10-22	Clean up after the build.	SVN	JIRA
`compiler`	B	3.6.0	2016-10-29	Compiles Java sources.	SVN	JIRA
`deploy`	B	2.8.2	2014-08-27	Deploy the built artifact to the remote repository.	SVN	JIRA
`failsafe`	B	2.19.1	2016-01-03	Run the JUnit integration tests in an isolated classloader.	GIT	JIRA
`install`	B	2.5.2	2014-08-27	Install the built artifact into the local repository.	SVN	JIRA
`resources`	B	3.0.1	2016-06-03	Copy the resources to the output directory for including in the JAR.	SVN	JIRA
`site`	B	3.5.1	2016-04-15	Generate a site for the current project.	SVN	JIRA
`surefire`	B	2.19.1	2016-	Run the JUnit unit tests in an isolated classloader.	GIT	JIRA

.m2/repository/org/apache/maven

First launch mvn … will download ~150Mo ...




```
$ ls
apache-maven            maven-artifact-manager   maven-plugin-parameter-documenter  plugins
archetype               maven-builder-support    maven-plugin-registry              plugin-testing
archetypes              maven-compat             maven-plugin-tools                 plugin-tools
doxia                   maven-core               maven-plugin-tools-api             release
enforcer                maven-dependency-plugin  maven-profile                      reporting
indexer                 maven-embedder           maven-project                      scm
its                     maven-error-diagnostics  maven-project-builder              shared
jxr                     maven-model              maven-repository-metadata          skins
maven                   maven-model-builder      maven-script                       surefire
maven-aether-provider   maven-monitor            maven-script-ant                   wagon
maven-ant-tasks         maven-parent             maven-settings
maven-archiver          maven-plugin-api         maven-settings-builder
maven-artifact          maven-plugin-descriptor  maven-toolchain
```

```
$ pwd
/home/arnaud/.m2/repository/org/apache/maven
$ du -sh
166M    .
```

Maven .m2/repository/ …/plugins standard plugins in local repository

```
$ cd plugins/
$ ls
maven-acr-plugin          maven-idea-plugin                                maven-plugins-aggregator
maven-ant-plugin          maven-install-plugin                             maven-pmd-plugin
maven-antrun-plugin       maven-invoker-plugin                             maven-project-info-reports-plugin
maven-archetype-plugin    maven-jar-plugin                                 maven-rar-plugin
maven-assembly-plugin     maven-jarsigner-plugin                           maven-reactor-plugin
maven-build-helper        maven-javadoc-plugin                             maven-release-plugin
maven-changelog-plugin    maven-jxr-plugin                                 maven-remote-resources-plugin
maven-changes-plugin      maven-linkcheck-plugin                           maven-repository-plugin
maven-checkstyle-plugin   maven-metadata-central.xml                       maven-resources-plugin
maven-clean-plugin        maven-metadata-central.xml.sha1                  maven-scm-publish-plugin
maven-compiler-plugin     maven-metadata-jboss-public-repository-group.xml maven-shade-plugin
maven-dependency-plugin   maven-metadata-jboss-public-repository-group.xml.sha1 maven-site-plugin
maven-deploy-plugin       maven-metadata-local.xml                         maven-source-plugin
maven-doap-plugin         maven-metadata-maven-central.xml                 maven-stage-plugin
maven-docck-plugin        maven-metadata-maven-central.xml.sha1            maven-surefire-plugin
maven-ear-plugin          maven-metadata-repo.jenkins-ci.org.xml           maven-surefire-report-plugin
maven-eclipse-plugin      maven-metadata-repo.jenkins-ci.org.xml.sha1      maven-toolchains-plugin
maven-ejb-plugin          maven-patch-plugin                               maven-verifier-plugin
maven-enforcer-plugin     maven-pdf-plugin                                 maven-war-plugin
maven-failsafe-plugin     maven-plugin-parent                              resolver-status.properties
maven-gpg-plugin          maven-plugin-plugin
maven-help-plugin         maven-plugins
```

Use build/plugins

```
<build>
    <plugins>
        <plugin>
            <groupId>org.apache.maven.plugins</groupId>
            <artifactId>maven-compiler-plugin</artifactId>
            <version>3.2</version>
        </plugin>
        <plugin>
            <groupId>org.codehaus.mojo</groupId>
            <artifactId>build-helper-maven-plugin</artifactId>
            <version>1.12</version>
        </plugin>
```

Use plugin

Use Another

Declare plugin Dependencies … with GAV
(as “build dependencies” but in section plugins)
=> Plugin will register itself in build lifecycle
see next for configuring..

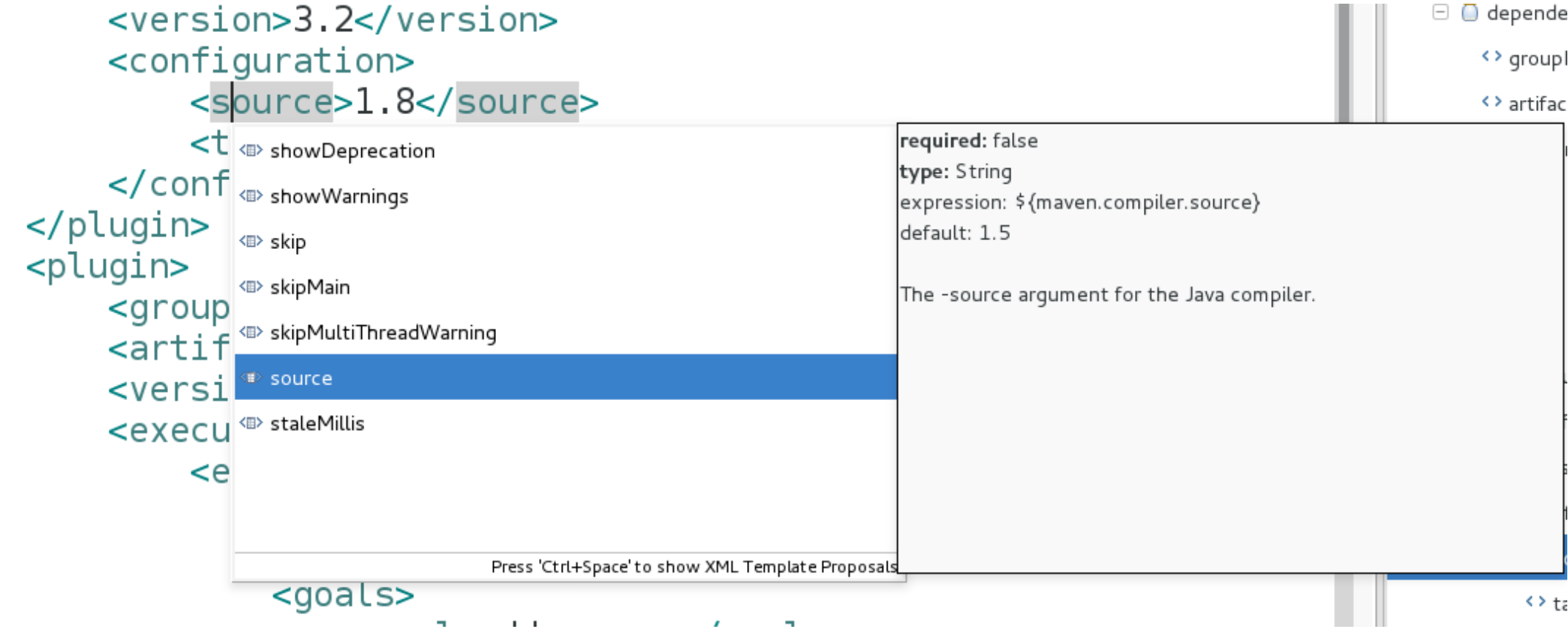
Plugin <configuration>

```
<build>
    <plugins>
        <plugin>
            <groupId>org.apache.maven.plugins</groupId>
            <artifactId>maven-compiler-plugin</artifactId>
            <version>3.2</version>
            <configuration>
                <source>1.8</source>
                <target>1.8</target>
            </configuration>
        </plugin>
```

Override plugin configuration

<source> = “-source” for javac compiler … list of options => cf next

Eclipse Auto-Completion for Plugin Configuration



Maven Plugin Doc Site
https://maven.apache.org/plugins

compiler:compile

Full name:

org.apache.maven.plugins:maven-compiler-plugin:3.6.0:compile

Descri

Compiles

See Plugin Goals & Usage

Attributes:

- Requires a Maven project to be executed.
- Requires dependency resolution of artifacts in scope: `compile`.
- Since version: `2.0`.
- Binds by default to the lifecycle phase: `compile`.

Optional Parameters

lse.

User property is: `maven.compiler.skip`

In 2016
default value to change
for jdk8 !!

source	`String`	`2.0`	The -source argument for the Java compiler. **Default value is**: `1.5`. **User property is**: `maven.compiler.source`.
staleMillis	`int`	`2.0`	Sets the granularity in milliseconds of the last modification date for testing whether a source needs recompilation. **Default value is**: `0`. **User property is**: `lastModGranularityMs`.
target	`String`	`2.0`	The -target argument for the Java compiler. **Default value is**: `1.5`. **User property is**: `maven.compiler.target`.
useIncrementalCompilation	`boolean`	`2.0`	to enable/disable incrementation compilation feature

Configuration Override Properties

Project properties

```
<properties>
    <java.version>1.8</java.version>
</properties>
```

```
<plugin>
  <groupId>org.apache.maven.plugins</groupId>
  <artifactId>maven-compiler-plugin</artifactId>
  <configuration>
      <source>1.8</source>
      <!-- default to <source>${maven.compiler.source}</source> -->
```

Properties Override Hierarchy (bis)

override

User ~/.m2/settings.xml

```
<profile>
    <id>jdk8-profile</id>
    <properties>
        <java.version>1.8</java.version>
```

override

Project properties

```
<properties>
    <java.version>1.8</java.version>
</properties>
```

Command Line arguments

```
$ mvn -Pjdk8-profile -Dmaven.compiler.source=1.8   clean install
[INFO] Scanning for projects...
```

plugins/executions

```
<plugin>
    <groupId>org.codehaus.mojo</groupId>
    <artifactId>build-helper-maven-plugin</artifactId>
    <version>1.12</version>
    <executions>
        <execution>
            <id>add-source</id>
            <phase>generate-sources</phase>
            <goals>
                <goal>add-source</goal>
            </goals>
            <configuration>
                <sources>
                    <source>target/generated-source</source>
                </sources>
            </configuration>
        </execution>
    </executions>
</plugin>
```

1 execution

Can add others
...

When processing lifecycle phase

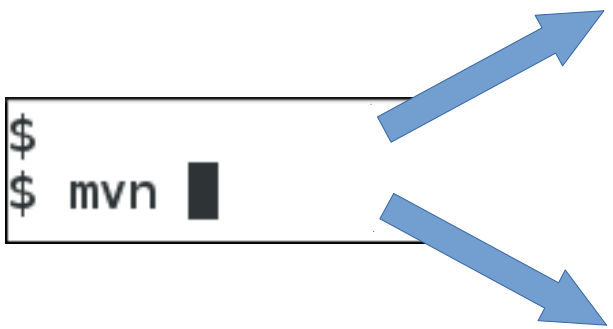
Then call plugin goal

With this parameter

Plugin Execution Override

Command Line
Explicit Plugin Goal Execution

```
$ mvn clean install  | grep '@'
[INFO] --- maven-clean-plugin:2.5:clean (default-clean) @ test-mvn ---
[INFO] --- build-helper-maven-plugin:1.12:add-source (add-source) @ test-mvn ---
[INFO] --- maven-resources-plugin:2.6:resources (default-resources) @ test-mvn ---
[INFO] --- maven-compiler-plugin:3.2:compile (default-compile) @ test-mvn ---
[INFO] --- maven-resources-plugin:2.6:testResources (default-testResources) @ test-mv
[INFO] --- maven-compiler-plugin:3.2:testCompile (default-testCompile) @ test-mvn ---
[INFO] --- maven-surefire-plugin:2.12.4:test (default-test) @ test-mvn ---
[INFO] --- maven-jar-plugin:2.4:jar (default-jar) @ test-mvn ---
[INFO] --- maven-install-plugin:2.4:install (default-install) @ test-mvn ---
```



Call build lifecycle 1..* phase(s)
=> sequence of plugin goals

Call explicit 1..* plugin goal(s)

```
$ mvn compiler:compile | grep '@'
[INFO] --- maven-compiler-plugin:3.2:compile (default-cli) @ test-mvn ---
```

Example of Plugin Goals

```
mvn help:effective-pom

mvn dependency:tree

mvn springboot:run

mvn sonar:sonar

mvn compiler:compile

# using explicit group:artifact:goal
mvn org.apache.maven.plugins:maven-compiler-plugin:compile

# explicit version  group:artifact:version:goal
mvn org.apache.maven.plugins:maven-compiler-plugin:3.1:compile
```

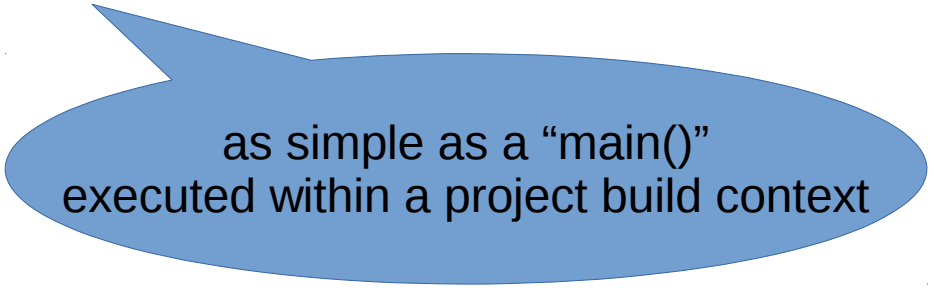
Plugin Internal “Mojo” Classes

```
import org.apache.maven.plugin.AbstractMojo;
import org.apache.maven.plugins.annotations.Mojo;

@Mojo(name = "hello-world")
public class MyHelloWorldMojo extends AbstractMojo {

    public void execute() {
        getLog().info("Hello Mojo World!");
    }

}
```



Run Mojo Hello World ...

```
$ mvn fr.an.tests:test-mvn-mojo:1.0-SNAPSHOT:hello-world
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building test-mvn-mojo Maven Mojo 1.0-SNAPSHOT
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- test-mvn-mojo:1.0-SNAPSHOT:hello-world (default-cli) @ test-mvn-mojo
[INFO] Hello Mojo World!
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 0.144 s
[INFO] Finished at: 2016-11-06T23:30:52+01:00
[INFO] Final Memory: 5M/283M
[INFO] ------------------------------------------------------------------------
```

Mojo Context Injection @Parameter

```
@Mojo(name = "add-source", defaultPhase = LifecyclePhase.GENERATE_SOURCES,
public class AddSourceMojo extends AbstractMojo {

    @Parameter(required = true)
    private File[] sources;

    @Parameter(readonly = true, defaultValue = "${project}")
    private MavenProject project;

    public void execute() {
        for (File source : this.sources) {
            this.project.addCompileSourceRoot(source.getAbsolutePath());
            if (!(getLog().isInfoEnabled()))
                continue;
            getLog().info("Source directory: " + source + " added.");
        }
    }
}
```

Inject from <configuration><sources>..

default properties for values

Inject the FAMOUS pom

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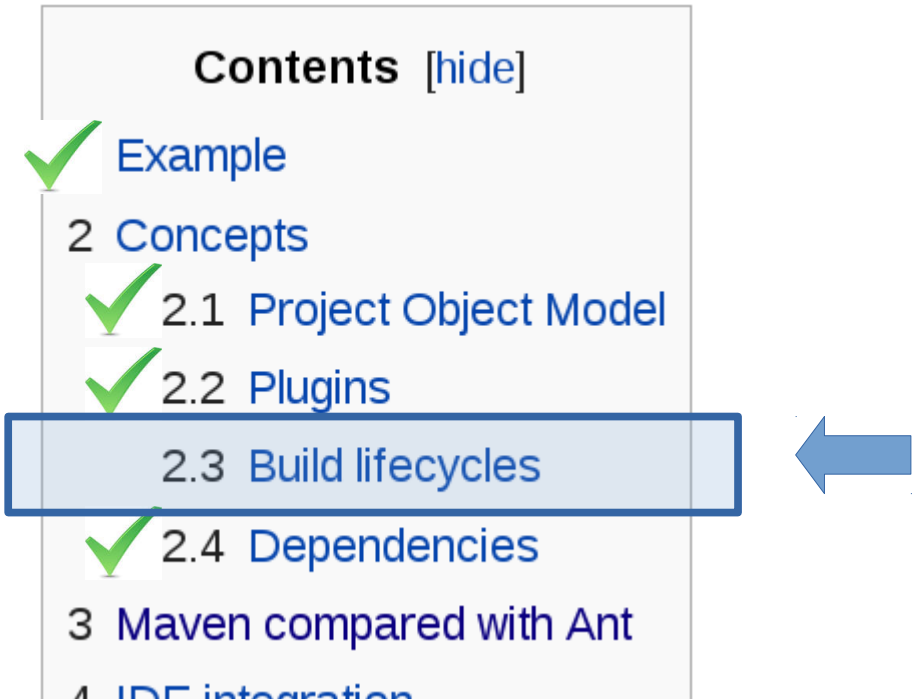
The Free Encyclopedia

Maven Core Concepts 4 : Build Lifecycle - Phases



Maven Phases

Build lifecycles [edit]

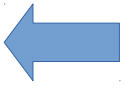
Build lifecycle is a list of named *phases* that can be used to give order to goal execution. One of Maven's standard lifecycles is the *default lifecycle*, which includes the following phases, in this order:[12]

```
 1  validate
 2  generate-sources
 3  process-sources
 4  generate-resources
 5  process-resources
 6  compile
 7  process-test-sources
 8  process-test-resources
 9  test-compile
10  test
11  package
12  install
13  deploy
```

Goals provided by plugins can be associated with different phases of the lifecycle. For example, by default, the goal "compiler:compile" is associated with the "compile" phase, while the goal "surefire:test" is associated with the "test" phase. Consider the following command:

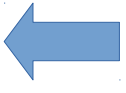
Register Goals Execution in Phases

```
<execution>
    <id>add-source</id>
    <phase>generate-sources</phase>
    <goals>
        <goal>add-source</goal>
```



Explicit
Goal Execution
per <phase>

```
<plugin>
    <groupId>fr.an.tests</groupId>
    <artifactId>test-mvn-mojo</artifactId>
    <version>1.0-SNAPSHOT</version>
    <extensions>true</extensions>
</plugin>
```



Implicit
Goal Execution
per Phase

```
@Mojo(name = "compile-hello-world", defaultPhase=LifecyclePhase.COMPILE)
@Execute(goal = "compile-hello-world",
    phase = LifecyclePhase.COMPILE, lifecycle = "default")
public class MyCompileHelloWorldMojo extends AbstractMojo {
```

Project Type → LifeCycle → Phases → Plugins Mojo

```
<groupId>fr.an.tests</groupId>
<artifactId>test-mvn-archetype1</artifactId>
<version>1.0-SNAPSHOT</version>
<packaging>jar</packaging>
```

repository/org/apache/maven/plugins/

Maven-**jar**-plugin-3.0.2.jar

META-INF/plexus/components.xml

```
<!--
  | Defining the phases with their appropriate plugins
  ! and versions which will be executed during the 'default'
  ! life cycle.
-->
<component>
  <role>org.apache.maven.lifecycle.mapping.LifecycleMapping</role>
  <role-hint>jar</role-hint>
  <implementation>org.apache.maven.lifecycle.mapping.DefaultLifecycleMapping</
  <configuration>
    <lifecycles>
      <lifecycle>
        <id>default</id>
        <!-- START SNIPPET: jar-lifecycle -->
        <phases>
          <process-resources>
            org.apache.maven.plugins:maven-resources-plugin:2.7:resources
          </process-resources>
          <compile>
            org.apache.maven.plugins:maven-compiler-plugin:3.5.1:compile
          </compile>
          <process-test-resources>
            org.apache.maven.plugins:maven-resources-plugin:2.7:testResources
          </process-test-resources>
          <test-compile>
            org.apache.maven.plugins:maven-compiler-plugin:3.5.1:testCompile
          </test-compile>
          <test>
            org.apache.maven.plugins:maven-surefire-plugin:2.19.1:test
          </test>
          <package>
            org.apache.maven.plugins:maven-jar-plugin:3.0.2:jar
          </package>
          <install>
            org.apache.maven.plugins:maven-install-plugin:2.5.2:install
          </install>
          <deploy>
            org.apache.maven.plugins:maven-deploy-plugin:2.8.2:deploy
          </deploy>
        </phases>
```

Conclusion

Questions ?
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Only a “Short”
Introduction to Concepts...
other docs:

http://arnaud-nauwynck.github.io/
http://arnaud.nauwynck.free.fr/

This document:

http://arnaud-nauwynck.github.io/docs/Maven-Intro-Concepts.pdf