

Construction automatique

avec

MavenTM

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(avec bcp de slides de Mathias Cousté)

Polytech'Nice Sophia – SI3

Mozilla Firefox



Do you remember?

Commits

	All Time	12 Month	30 Day
Commits:	797291	37512	3079
Contributors:	8663	1000	377
Files Modified:	745637	118157	16090
Lines Added:	358455772	15670609	1984093
Lines Removed	264657826	11950585	1191321

Commits per Month

Zoom 1yr 3yr 5yr 10yr **All**

Aug. 2017 : 5194 contributors / 381 851 commits
Oct. 2022 : 8663 contributors / 797 291 commits



Let's compile, run tests...



In 2012, 1 commit ->

1 complete compilation + 1 run of all tests + 1 build of the binary took

137 hours of server

In August 2017, 5984 commits were done ->

$(31 \times 24 \times 60) / 5984 =$

1 commit every **7** minutes

Problèmes

- Vous ne pouvez pas le faire à la main
- Vous ne pouvez pas le faire dans votre IDE préféré
 - Le code est sur un serveur, etc.
- Mais ce ne sont que des dépendances entre des modules, des classes, des fichiers, des trucs...

Maven

- Projet de la fondation Apache
 - 2003 : Maven 1.x
 - 2005 : Maven 2.x
 - 2010 : Maven 3.x
- Outil de gestion de projet par construction automatisé
 - abstractions encourageant la standardisation des projets pour des problématiques récurrentes
 - Construction, test, distribution, documentation, collaborations...

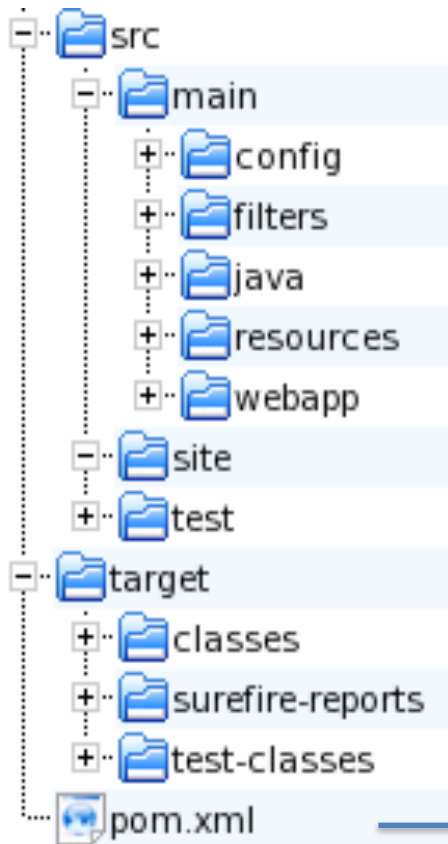
Maven

- Gestion de tâches comme des rapports, des dépendances, des configurations, des releases, des distributions, etc.
 - Approche entièrement déclarative non centrée sur les tâches à exécuter (comme ant ou make)
- Proposition de bonnes pratiques par défaut
 - Structuration du projet
 - Un seul livrable par projet Maven produit une seule sortie (Artefact maven)

CONVENTION OVER CONFIGURATION

Organisation

Structure



Fichier POM (Project Object Model)

- Description du projet
- A la racine du projet

```
<project xmlns="http://maven.apache.org/POM/4.0.0" ... >
  xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 ..."
  <modelVersion>4.0.0</modelVersion>
  <groupId>com.mycompany.app</groupId>
  <artifactId>my-app</artifactId>
  <packaging>jar</packaging>
  <version>1.0-SNAPSHOT</version>
  <name>Maven Quick Start Archetype</name>
  <url>http://maven.apache.org</url>
  <dependencies>
    <dependency>
      <groupId>junit</groupId>
      <artifactId>junit</artifactId>
      <version>3.8.1</version>
      <scope>test</scope>
    </dependency>
  </dependencies>
</project>
```

Pom.xml

```
1⊖ <project xmlns="http://maven.apache.org/POM/4.0.0"
2   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
3   xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
4   <modelVersion>4.0.0</modelVersion>
5
6   <groupId>fr.unice.polytech.si3.qgl</groupId>
7   <artifactId>frigates-engine</artifactId>
8   <version>1.0-SNAPSHOT</version>
9   <packaging>jar</packaging>
10
11
12
13⊖ <properties>
14   <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
15   <java.version>11</java.version>
16   <maven.compiler.source>${java.version}</maven.compiler.source>
17   <maven.compiler.target>${java.version}</maven.compiler.target>
18   <jackson.databind.version>2.10.1</jackson.databind.version>
19 </properties>
20
21⊖ <dependencies>
22   <!-- Interface with referee -->
23⊖   <dependency>
24     <groupId>fr.unice.polytech.si3.qgl</groupId>
25     <artifactId>regatta-cockpit</artifactId>
26     <version>0.1-SNAPSHOT</version>
27   </dependency>
```


Pom.xml

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target/frigates-engine-
1.0-SNAPSHOT.jar

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25        <artifactId>regatta.cockpit</artifactId>
26        <version>0.1-SNAPSHOT</version>
27    </dependency>
```

Gestion des dépendances

- Toutes les dépendances ne sont pas utiles tout le temps
 - Certaines uniquement pour les tests
 - D'autres sont fournies par les serveurs d'applications...
- Maven propose 4 portées de dépendance:
 - **Compile**: (par défaut) dispo dans toutes les phases
 - **Provided**: utilisé pour compiler mais pas au déploiement
 - **Runtime**: pas nécessaire à la compilation mais uniquement à l'exécution (driver JDBC par exemple)
 - **Test** : uniquement pour compiler et exécuter les tests

Gestion des dépendances (2)

```
<project>
[...]  
<dependencies>
  <dependency>
    <groupId>log4j</groupId>
    <artifactId>log4j</artifactId>
    <version>1.2.14</version>
  </dependency>
  <dependency>
    <groupId>junit</groupId>
    <artifactId>junit</artifactId>
    <version>3.8.1</version>
    <scope>test</scope>
  </dependency>
</dependencies>
[...]  
</project>
```

- Télécharge le jar (automatiquement !)
- Place le classpath (spécifiquement pour les tests dans l'exemple)
- Les dépendances sont maintenues à jour

Dependencies

```
<dependencies>
  <!-- Geometry API -->
  <dependency>
    <groupId>fr.unice.polytech.si3.qgl</groupId>
    <artifactId>geometry-api</artifactId>
    <version>1.0-SNAPSHOT</version>
  </dependency>

  <!-- Unit tests -->
  <dependency>
    <groupId>junit</groupId>
    <artifactId>junit</artifactId>
    <version>4.12</version>
    <scope>test</scope>
  </dependency>
</dependencies>
```

Dependencies

```
<dependencies>
  <!-- Geometry API -->
  <dependency>
    <groupId>fr.unice.polytech.si3.qgl</groupId>
    <artifactId>geometry-api</artifactId>
    <version>1.0-SNAPSHOT</version>
  </dependency>

  <!-- Unit tests -->
  <dependency>
    <groupId>junit</groupId>
    <artifactId>junit</artifactId>
    <version>4.12</version>
    <scope>test</scope>
  </dependency>
</dependencies>
```

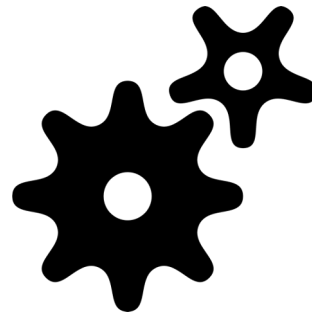
Dependencies

```
<dependencies>
  <!-- Geometry API -->
  <dependency>
    <groupId>fr.unice.polytech.si3.qgl</groupId>
    <artifactId>geometry-api</artifactId>
    <version>1.0-SNAPSHOT</version>
  </dependency>

  <!-- Unit tests -->
  <dependency>
    <groupId>junit</groupId>
    <artifactId>junit</artifactId>
    <version>4.12</version>
    <scope>test</scope>
  </dependency>
</dependencies>
```

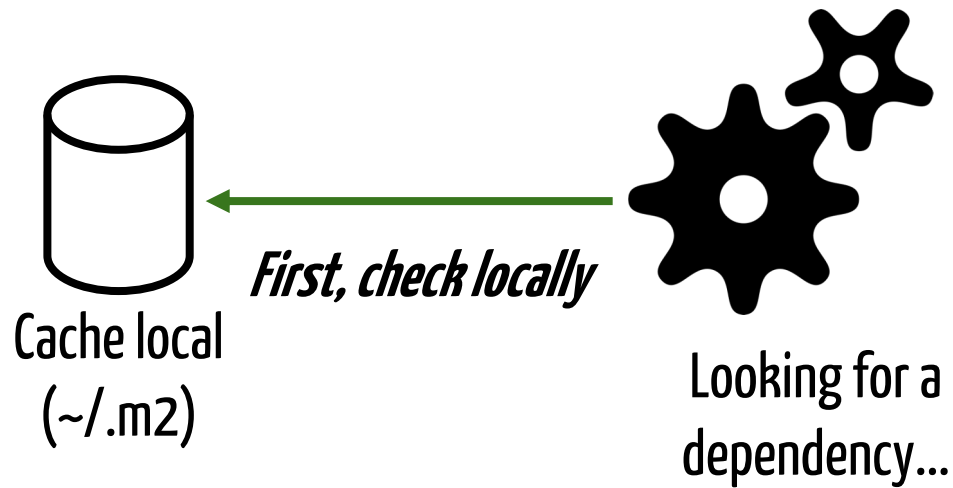
- compile
- runtime
- provided
- system
- test
- import

Dependencies

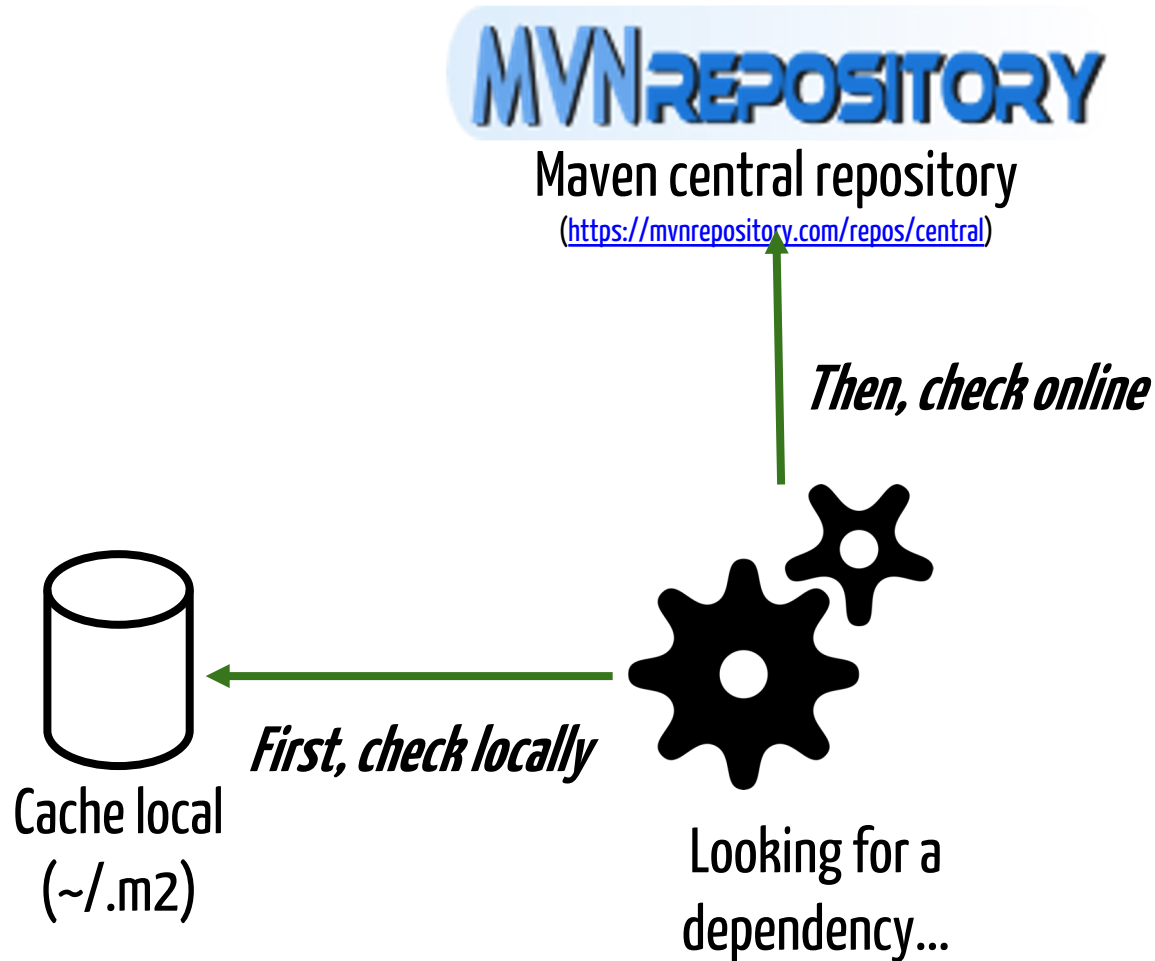


Looking for a
dependency...

Dependencies

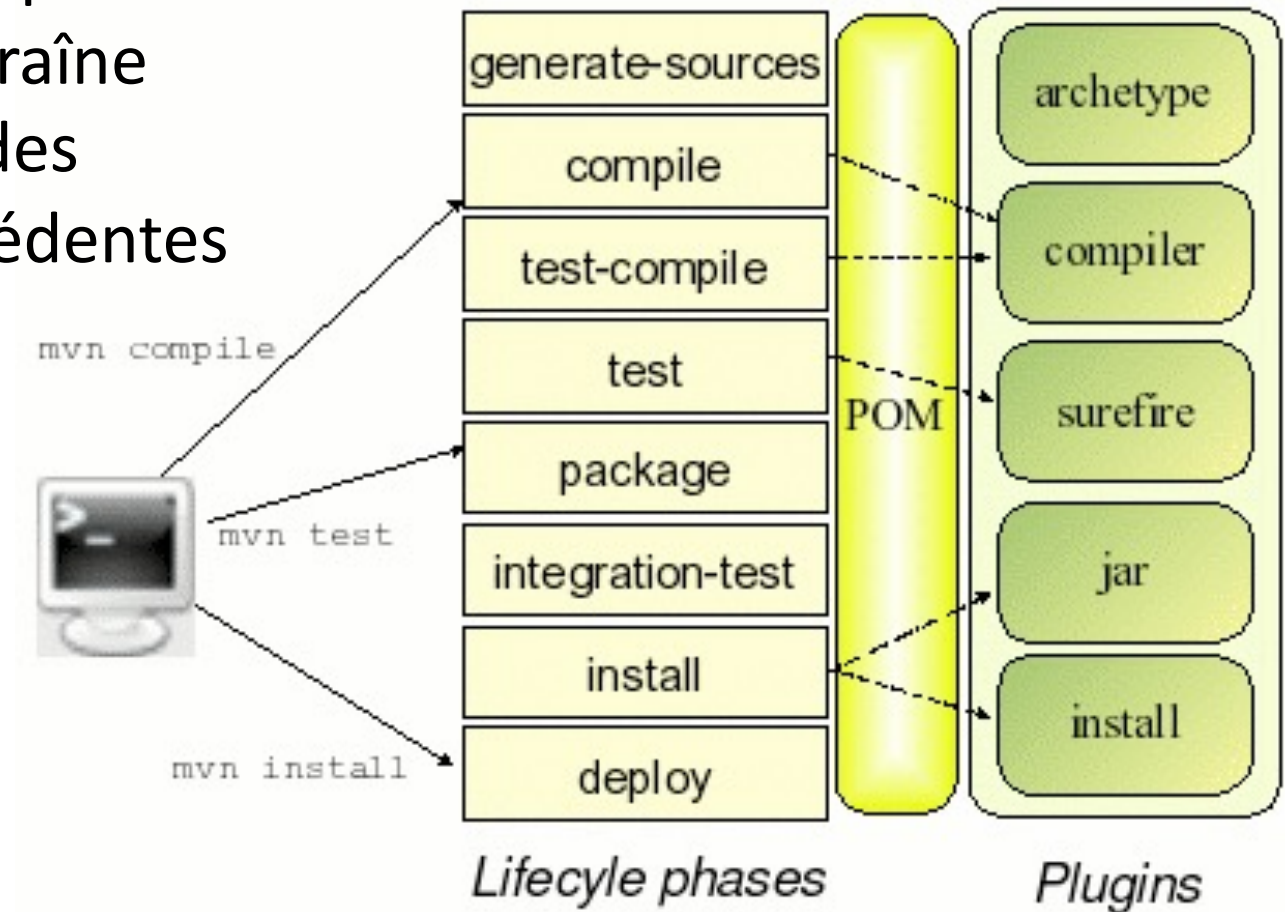


Dependencies



Cycle de vie du projet

- Appeler une phase du cycle entraîne l'exécution des phases précédentes



Phases

- clean
- validate
- compile
- test
- package
- verify
- install
- deploy

Phases

- clean

- validate

- compile

- test

- package

- verify

- install

- deploy

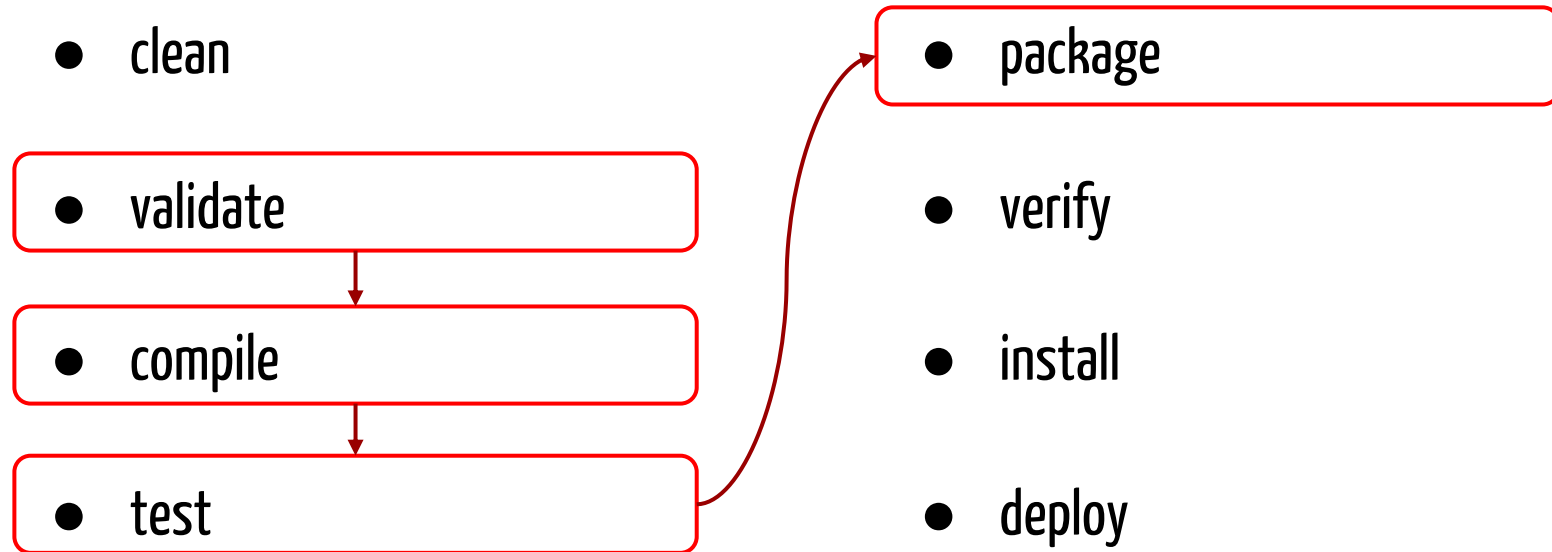
```
~ $ > mvn clean
```

Phases

- clean
- validate
- compile
- test
- package
- verify
- install
- deploy

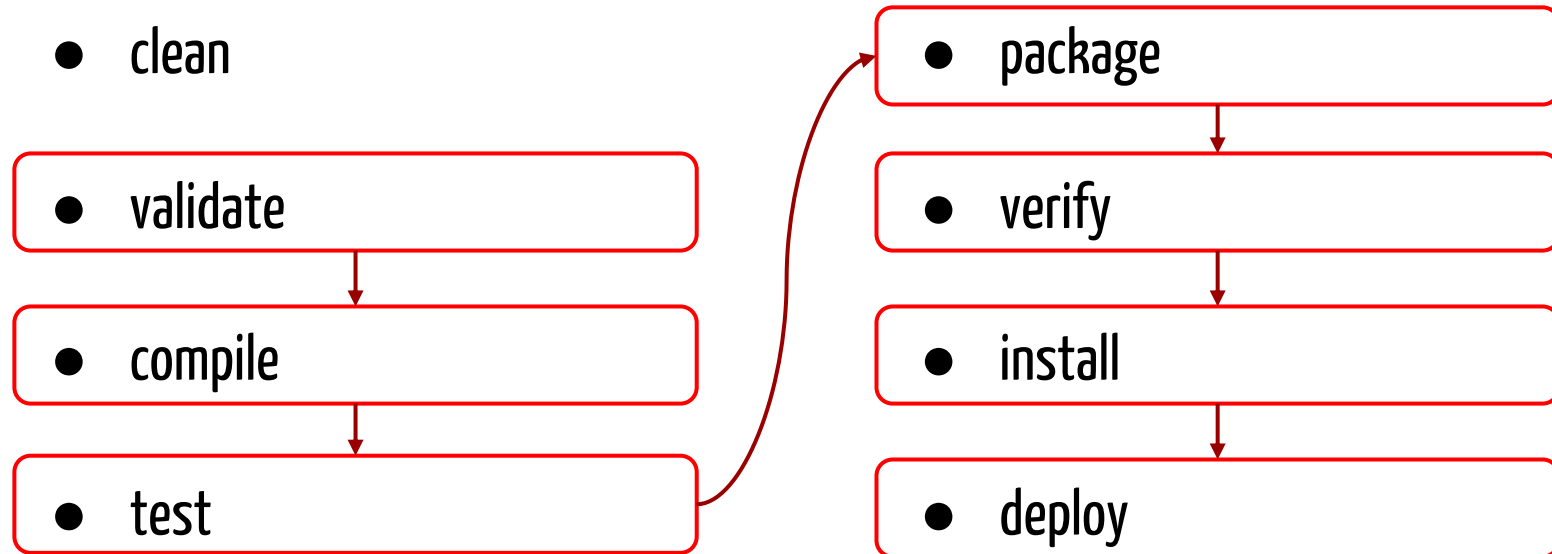
```
~ $ > mvn validate
```

Phases



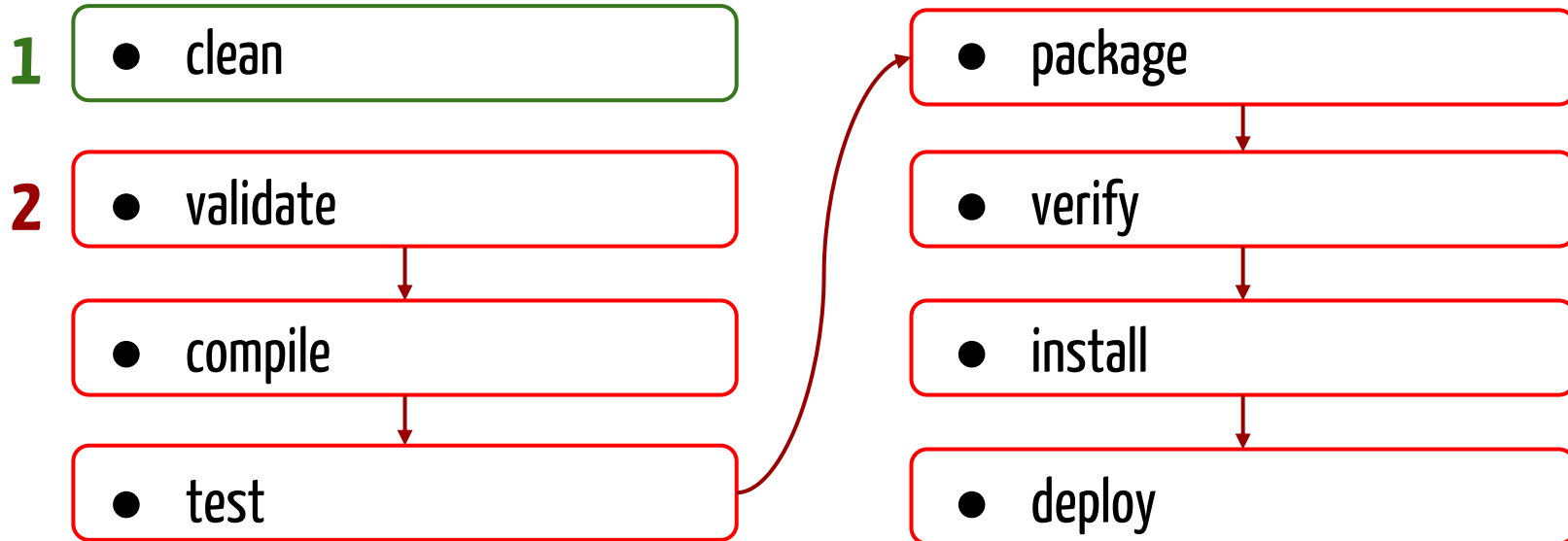
~ \$ > mvn package

Phases



~ \$ > mvn deploy

Phases



~ \$ > mvn clean deploy

Et pour exécuter ?

- Exec Maven Plugin
 - <http://www.mojohaus.org/exec-maven-plugin/>
- **exec:exec** pour exécuter des programmes (Java ou pas) dans un processus séparé
- **exec:java** pour exécuter des programmes Java dans la même machine virtuelle
- Avec plein plein d'options pour tout faire de manière indépendante de la plateforme

```
$ mvn exec:java
```

Plugins & executions

```
<build>
  <plugins>
    <plugin>
      <groupId>org.apache.maven.plugins</groupId>
      <artifactId>maven-assembly-plugin</artifactId>
      <executions>
        <execution>
          <phase>package</phase>
          <goals>
            <goal>single</goal>
          </goals>
          <configuration>
            <archive>
              <manifest>
                <mainClass>
                  fr.unice.polytech.si3.qgl.frigatesengine.App
                </mainClass>
              </manifest>
            </archive>
            <descriptorRefs>
              <descriptorRef>jar-with-dependencies</descriptorRef>
            </descriptorRefs>
          </configuration>
        </execution>
      </executions>
    </plugin>
    <plugin>
      <groupId>org.codehaus.mojo</groupId>
      <artifactId>exec-maven-plugin</artifactId>
      <version>1.2.1</version>
      <executions>
        <execution>
          <goals>
            <goal>java</goal>
          </goals>
        </execution>
      </executions>
      <configuration>
        <mainClass>fr.unice.polytech.si3.qgl.gamerunner.App</mainClass>
      </configuration>
    </plugin>
  </plugins>
</build>
```


Plugins & executions

```
<build>
  <plugins>
    <plugin>
      <groupId>org.apache.maven.plugins</groupId>
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          <goals>
            <goal>single</goal>
          </goals>
          <configuration>
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              <manifest>
                <mainClass>
                  fr.unice.polytech.si3.qgl.frigatesengine.App
                </mainClass>
              </manifest>
            </archive>
            <descriptorRefs>
              <descriptorRef>jar-with-dependencies</descriptorRef>
            </descriptorRefs>
          </configuration>
        </execution>
      </executions>
    </plugin>
    <plugin>
      <groupId>org.codehaus.mojo</groupId>
      <artifactId>exec-maven-plugin</artifactId>
      <version>1.2.1</version>
      <executions>
        <execution>
          <goals>
            <goal>java</goal>
          </goals>
        </execution>
      </executions>
      <configuration>
        <mainClass>fr.unice.polytech.si3.qgl.gamerunner.App</mainClass>
      </configuration>
    </plugin>
  </plugins>
</build>
```

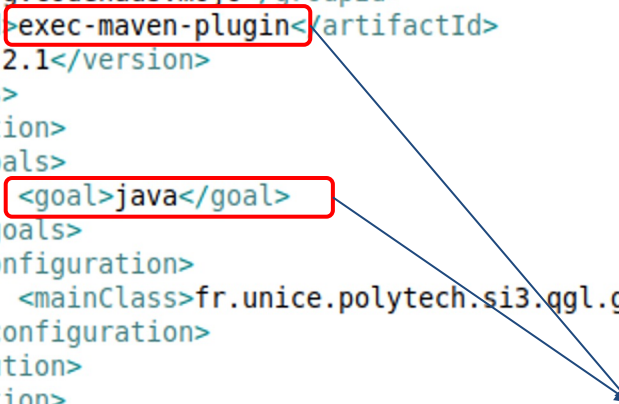
Plugins & executions

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        <execution>
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          <goals>
            <goal>single</goal>
          </goals>
          <configuration>
            <archive>
              <manifest>
                <mainClass>
                  fr.unice.polytech.si3.qgl.frigatesengine.App
                </mainClass>
              </manifest>
            </archive>
            <descriptorRefs>
              <descriptorRef>jar-with-dependencies</descriptorRef>
            </descriptorRefs>
          </configuration>
        </execution>
      </executions>
    </plugin>
    <plugin>
      <groupId>org.codehaus.mojo</groupId>
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      <version>1.2.1</version>
      <executions>
        <execution>
          <goals>
            <goal>java</goal>
          </goals>
        </execution>
      </executions>
      <configuration>
        <mainClass>fr.unice.polytech.si3.qgl.gamerunner.App</mainClass>
      </configuration>
    </plugin>
  </plugins>
</build>
```

mvn exec:java

Plugins & executions

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<plugin>
  <groupId>org.codehaus.mojo</groupId>
  <artifactId>exec-maven-plugin</artifactId>
  <version>1.2.1</version>
  <executions>
    <execution>
      <goals>
        <goal>java</goal>
      </goals>
      <configuration>
        <mainClass>fr.unice.polytech.si3.qgl.gamerunner.App</mainClass>
      </configuration>
    </execution>
    <execution>
      <goals>
        <goal>mytool</goal>
      </goals>
      <configuration>
        <mainClass>fr.unice.polytech.si3.qgl.gamerunner.MyTool</mainClass>
      </configuration>
    </execution>
  </executions>
</plugin>
```



mvn exec:java

Plugins & executions

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  <groupId>org.codehaus.mojo</groupId>
  <artifactId>exec-maven-plugin</artifactId>
  <version>1.2.1</version>
  <executions>
    <execution>
      <goals>
        <goal>java</goal>
      </goals>
      <configuration>
        <mainClass>fr.unice.polytech.si3.qgl.gamerunner.App</mainClass>
      </configuration>
    </execution>
    <execution>
      <goals>
        <goal>mytool</goal>
      </goals>
      <configuration>
        <mainClass>fr.unice.polytech.si3.qgl.gamerunner.MyTool</mainClass>
      </configuration>
    </execution>
  </executions>
</plugin>
```

mvn exec:mytool

Quelques commandes de base

- Nettoyage

```
$ mvn clean
```

- Exécution des tests unitaires

```
$ mvn test
```

- Packaging = compilation + test + création d'un jar

```
$ mvn package
```

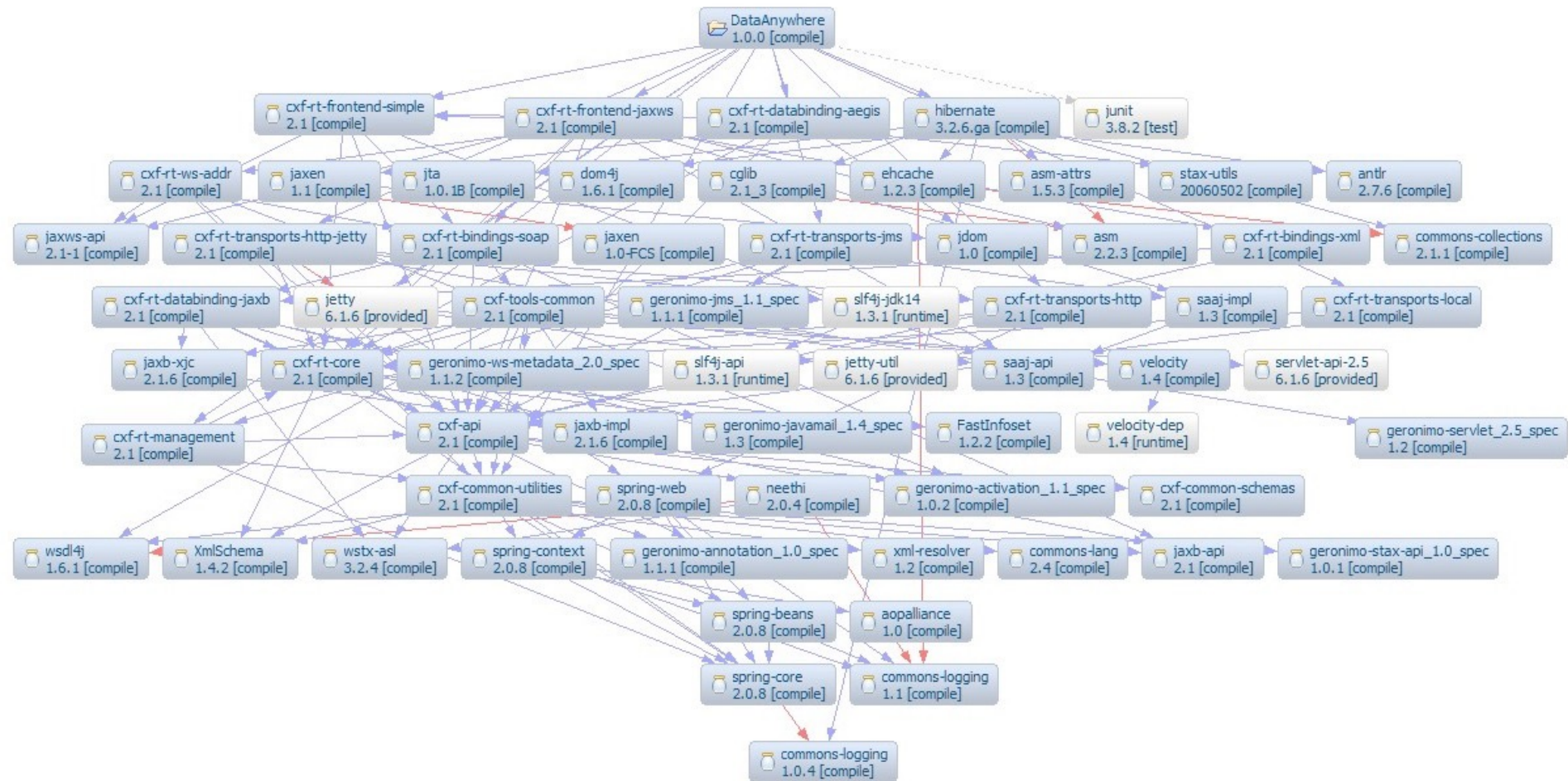
- Install = package + déploiement dans l'entrepôt Maven local

```
$ mvn install
```

- **A la livraison du prochain projet :**

```
$ mvn clean package
```

Gros projet... Bcp de dépendances !



Comment maven gère les dépendances transitives ?

```
$ mvn dependency:tree -Dverbose=true
```

```
+-- org.springframework:spring-context:jar:5.3.5:compile
| +- org.springframework:spring-aop:jar:5.3.5:compile
| | +- (org.springframework:spring-beans:jar:5.3.5:compile - omitted for duplicate)
| | \- (org.springframework:spring-core:jar:5.3.5:compile - omitted for duplicate)
| +- org.springframework:spring-beans:jar:5.3.5:compile
| | \- (org.springframework:spring-core:jar:5.3.5:compile - omitted for duplicate)
...
+- (org.springframework:spring-expression:jar:5.2.13.RELEASE:compile - omitted for conflict with 5.3.5)
\-- org.springframework:spring-web:jar:5.2.13.RELEASE:compile
    +- (org.springframework:spring-beans:jar:5.2.13.RELEASE:compile - omitted for conflict with 5.3.5)
    \- (org.springframework:spring-core:jar:5.2.13.RELEASE:compile - omitted for conflict with 5.3.5)
```

- Maven ne sait pas qu'une version est plus récente qu'une autre
- Maven choisit la dépendance transitive dans la profondeur de l'arbre, et la première qu'il arrive à résoudre...
- La solution : utilisez une section « dependencyManagement » pour donner les bonnes priorités

Quand tout va bien : juste une histoire de version...

```
<properties>
  <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
  <maven.compiler.source>1.8</maven.compiler.source>
  <maven.compiler.target>${maven.compiler.source}</maven.compiler.target>
  <junit.jupiter.version>5.4.0</junit.jupiter.version>
</properties>

<dependencies>
  <dependency>
    <groupId>org.junit.jupiter</groupId>
    <artifactId>junit-jupiter-api</artifactId>
    <version>${junit.jupiter.version}</version>
    <scope>test</scope>
  </dependency>
  <dependency>
    <groupId>org.junit.jupiter</groupId>
    <artifactId>junit-jupiter-params</artifactId>
    <version>${junit.jupiter.version}</version>
    <scope>test</scope>
  </dependency>
  <dependency>
    <groupId>org.junit.jupiter</groupId>
    <artifactId>junit-jupiter-engine</artifactId>
    <version>${junit.jupiter.version}</version>
    <scope>test</scope>
  </dependency>
</dependencies>
```


On peut faire mieux avec le BOM

```
<junit.bom.version>5.9.1</junit.bom.version>  
</properties>
```

```
<dependencyManagement> <!-- helps maven to resolve conflicting transitive dependencies -->  
  <dependencies>  
    <dependency>  
      <groupId>org.junit</groupId>  
      <artifactId>junit-bom</artifactId>  
      <version>${junit.bom.version}</version>  
      <type>pom</type>  
      <scope>import</scope>  
    </dependency>  
  </dependencies>  
</dependencyManagement>
```

```
<dependencies>  
  <dependency>  
    <groupId>org.junit.jupiter</groupId>  
    <artifactId>junit-jupiter</artifactId>  
    <scope>test</scope>  
  </dependency>  
</dependencies>
```

BOM = Bill of Material

- Un fichier POM spécial qui regroupe les versions de dépendances qui sont compatibles (et testées) entre elles
- Le fichier BOM peut être utilisé comme dépendance ou comme **parent**
- **Un pom parent permet l'importation automatique de configuration**
 - on verra cela en détail plus tard

Pom.xml fourni pour le 2nd projet <https://github.com/collet/ps5-template>

```
<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>TeamName</groupId> <!-- CHANGE ME -->
  <artifactId>JarName</artifactId> <!-- CHANGE ME -->
  <version>1.0-SNAPSHOT</version> <!-- CHANGE ME -->

  <properties>
    <project.build.sourceEncoding>UTF-8
  </project.build.sourceEncoding> <!-- CHANGE ME IF NEEDED, other : ISO-8859-1 -->
    <java.version>17</java.version>
    <maven.compiler.source>${java.version}</maven.compiler.source>
    <maven.compiler.target>${java.version}</maven.compiler.target>
    <junit.bom.version>5.9.1</junit.bom.version>
  </properties>
```

```
<dependencyManagement> <!-- helps maven to resolve conflicting transitive dependencies -->
  <dependencies>
    <dependency>
      <groupId>org.junit</groupId>
      <artifactId>junit-bom</artifactId>
      <version>${junit.bom.version}</version>
      <type>pom</type>
      <scope>import</scope>
    </dependency>
  </dependencies>
</dependencyManagement>
```

```
<dependencies>
  <dependency>
    <groupId>org.junit.jupiter</groupId>
    <artifactId>junit-jupiter</artifactId>
    <scope>test</scope>
  </dependency>
</dependencies>
```

```
<build>
  <plugins>
    <!-- JUnit 5.9.1 requires maven surefire 3.0.0-M6 / maven compiler 3.8.1 -->
    <plugin>
      <artifactId>maven-compiler-plugin</artifactId>
      <version>3.8.1</version>
    </plugin>

    <plugin>
      <artifactId>maven-surefire-plugin</artifactId>
      <version>3.0.0-M6</version>
    </plugin>
  </plugins>
</build>
```

```

<plugin>
  <groupId>org.codehaus.mojo</groupId>
  <artifactId>exec-maven-plugin</artifactId>
  <version>3.1.0</version>
  <executions>
    <execution>
      <goals>
        <goal>java</goal>
      </goals>
    </execution>
  </executions>
  <configuration>
    <mainClass>fr.cotedazur.univ.polytech.startingpoint.Main</mainClass> <!-- CHANGE ME -->
    <!--
      <arguments>
        <argument>argument1</argument>
      </arguments>
      <systemProperties>
        <systemProperty>
          <key>myproperty</key>
          <value>myvalue</value>
        </systemProperty>
      </systemProperties>
    -->
  </configuration>
</plugin>

```

```

</plugins>

```

```

</build>

```

```

</project>

```