Maven

Modul 14
Maven

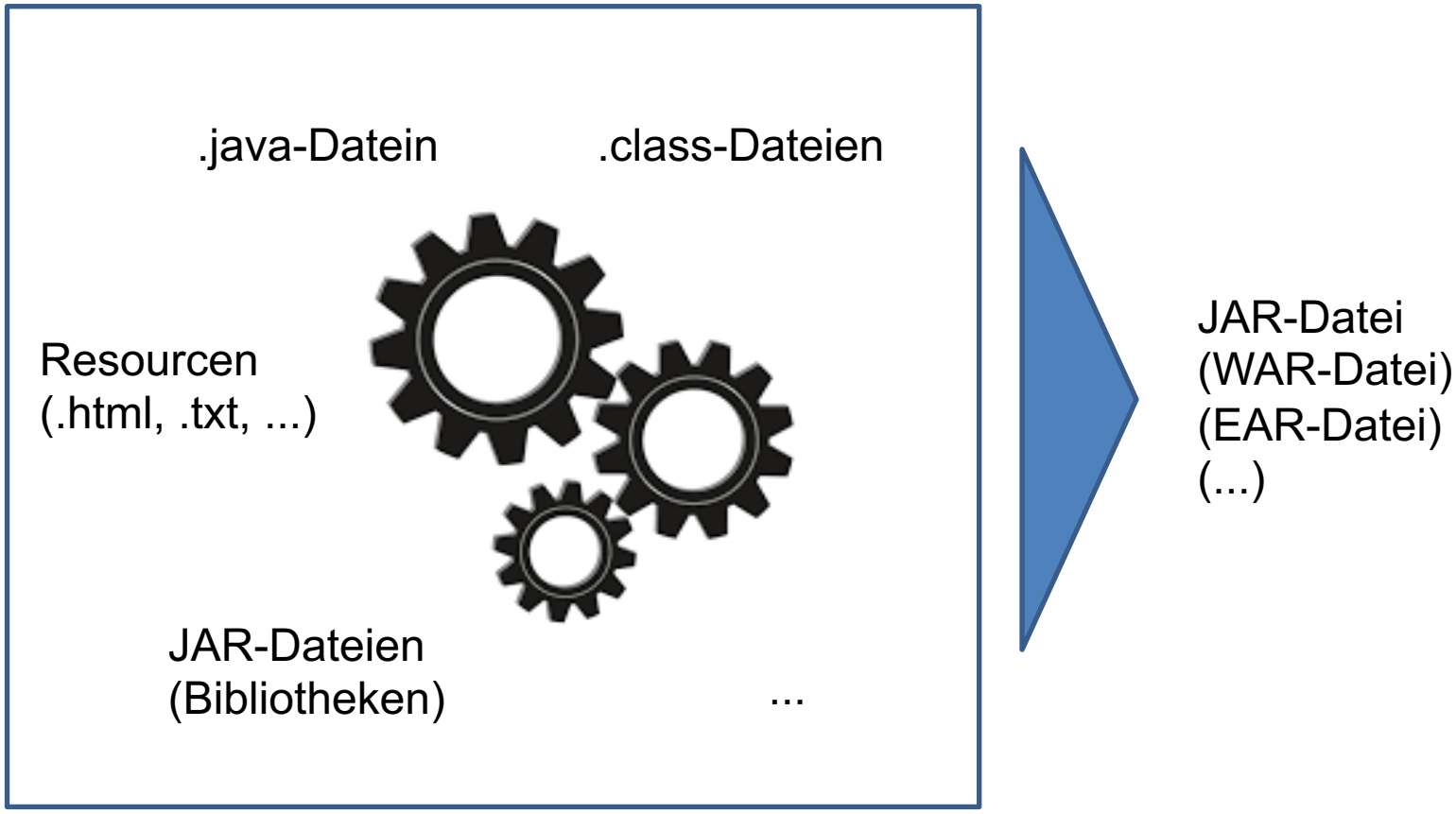
Command Line:

```
C:\> mvn
```

Aktuelle Verison:

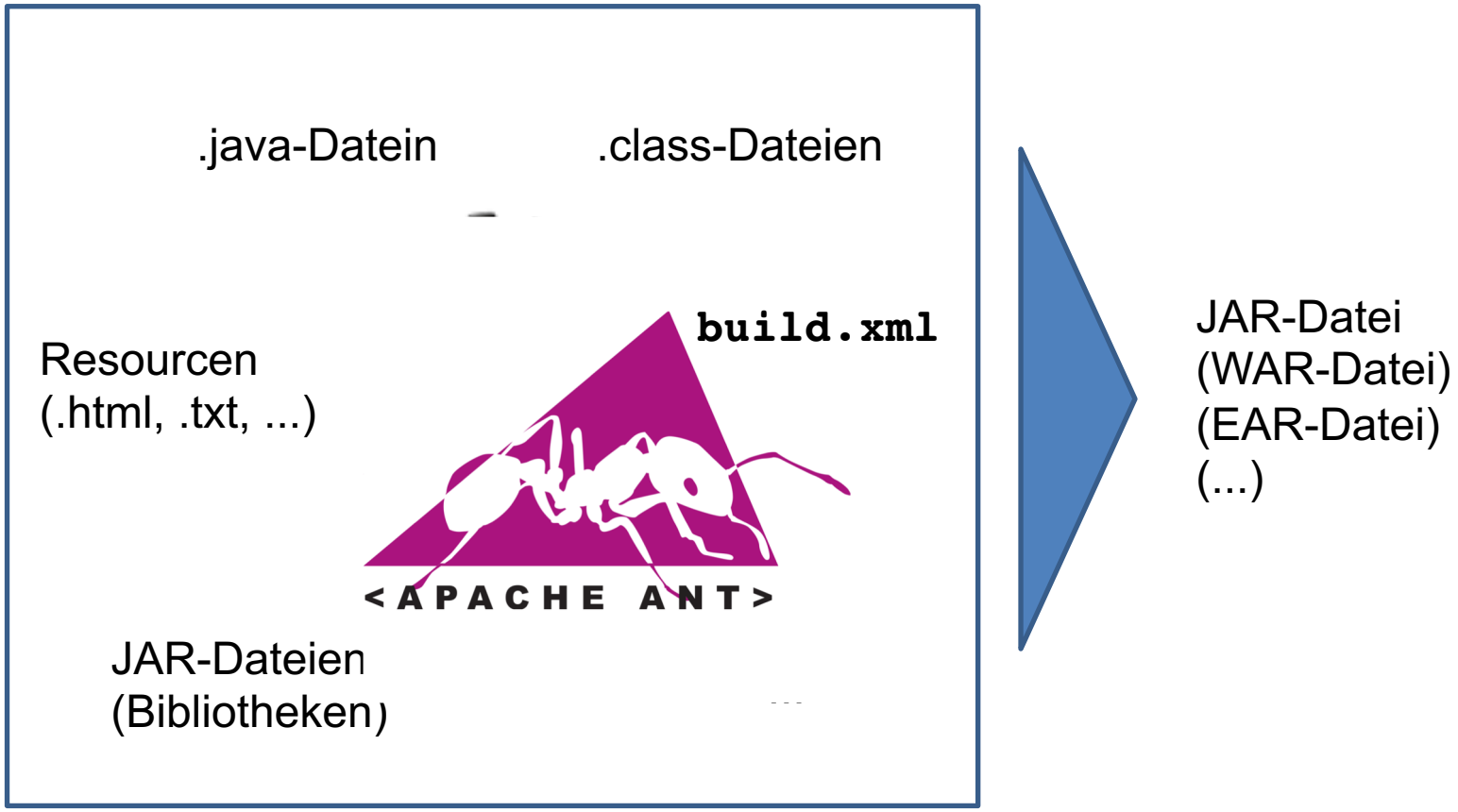
```
maven 3.6.0
```

Build Management System für Java



Modul 14
Was ist Maven?

Build Management System für Java



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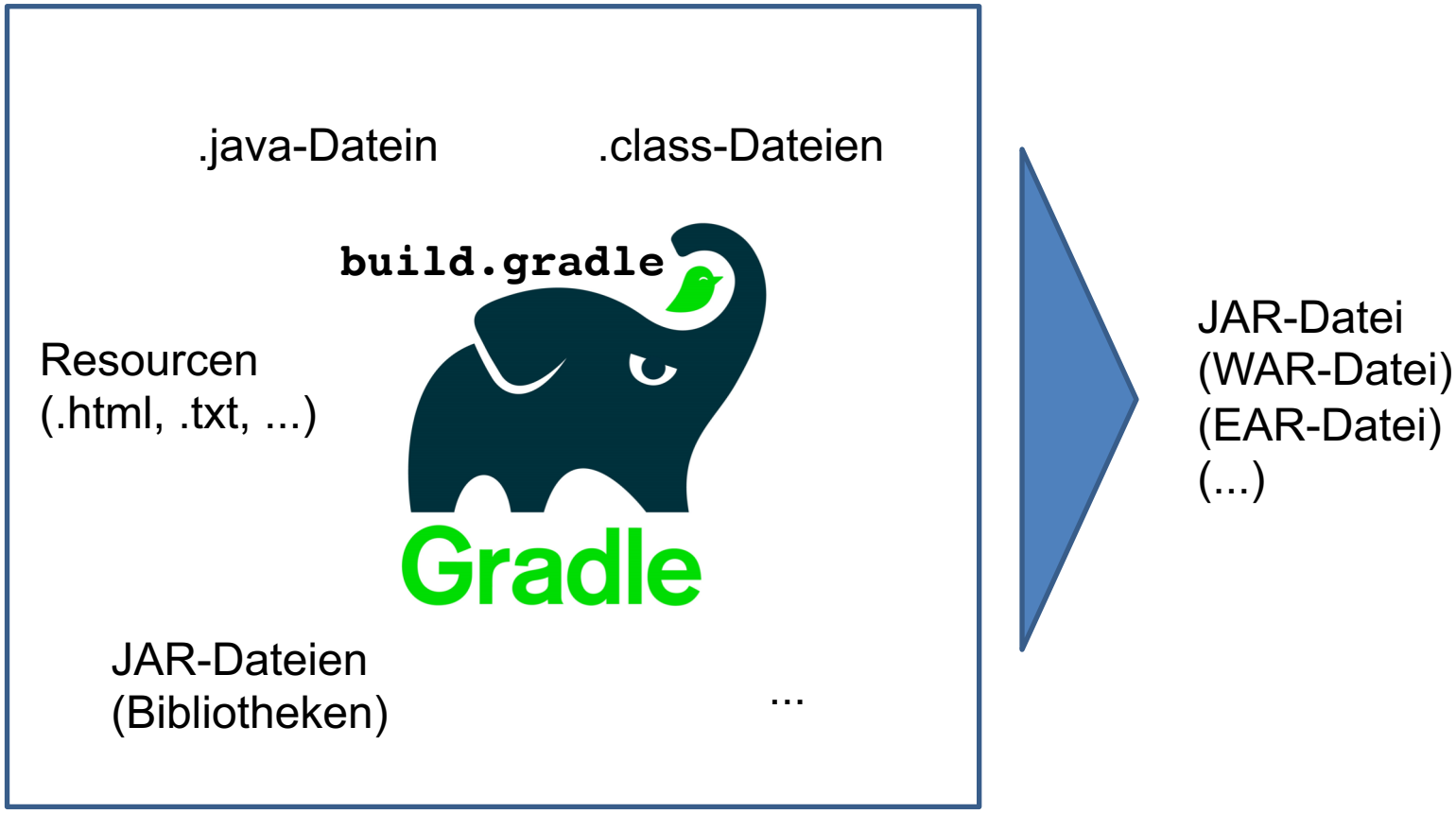
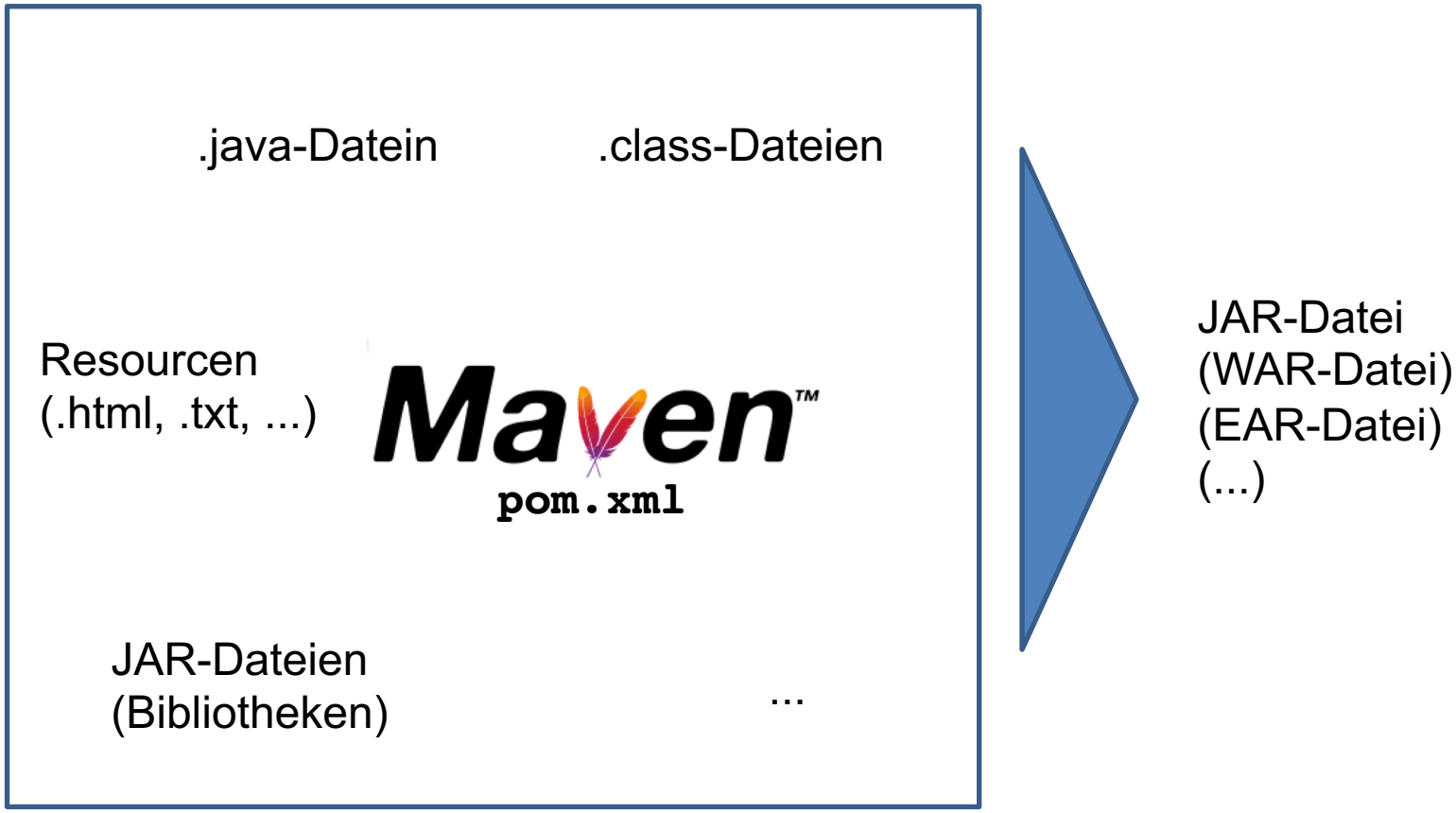


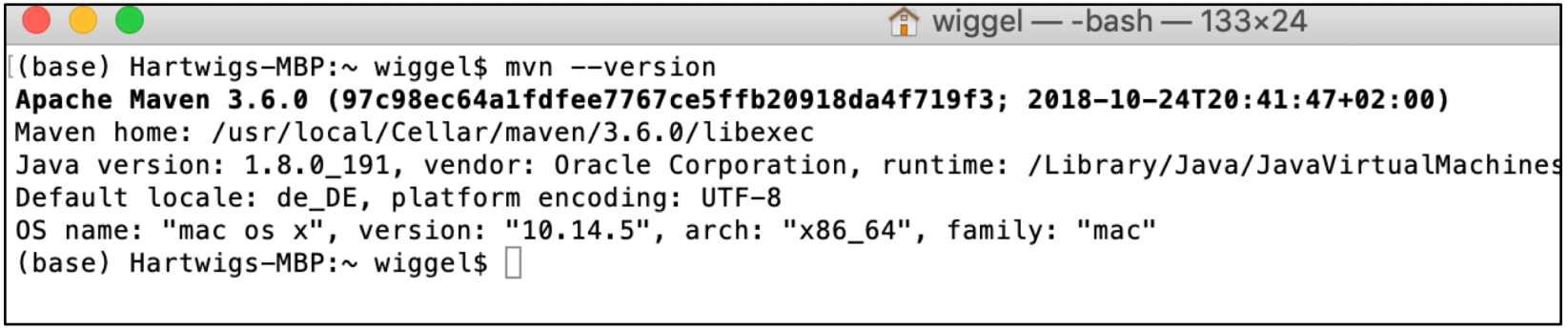
Modul 14
Was ist Maven?

Build Management System für Java



Modul 14
Maven Installation

```
unzip apache-maven-3.6.1-bin.zip
```

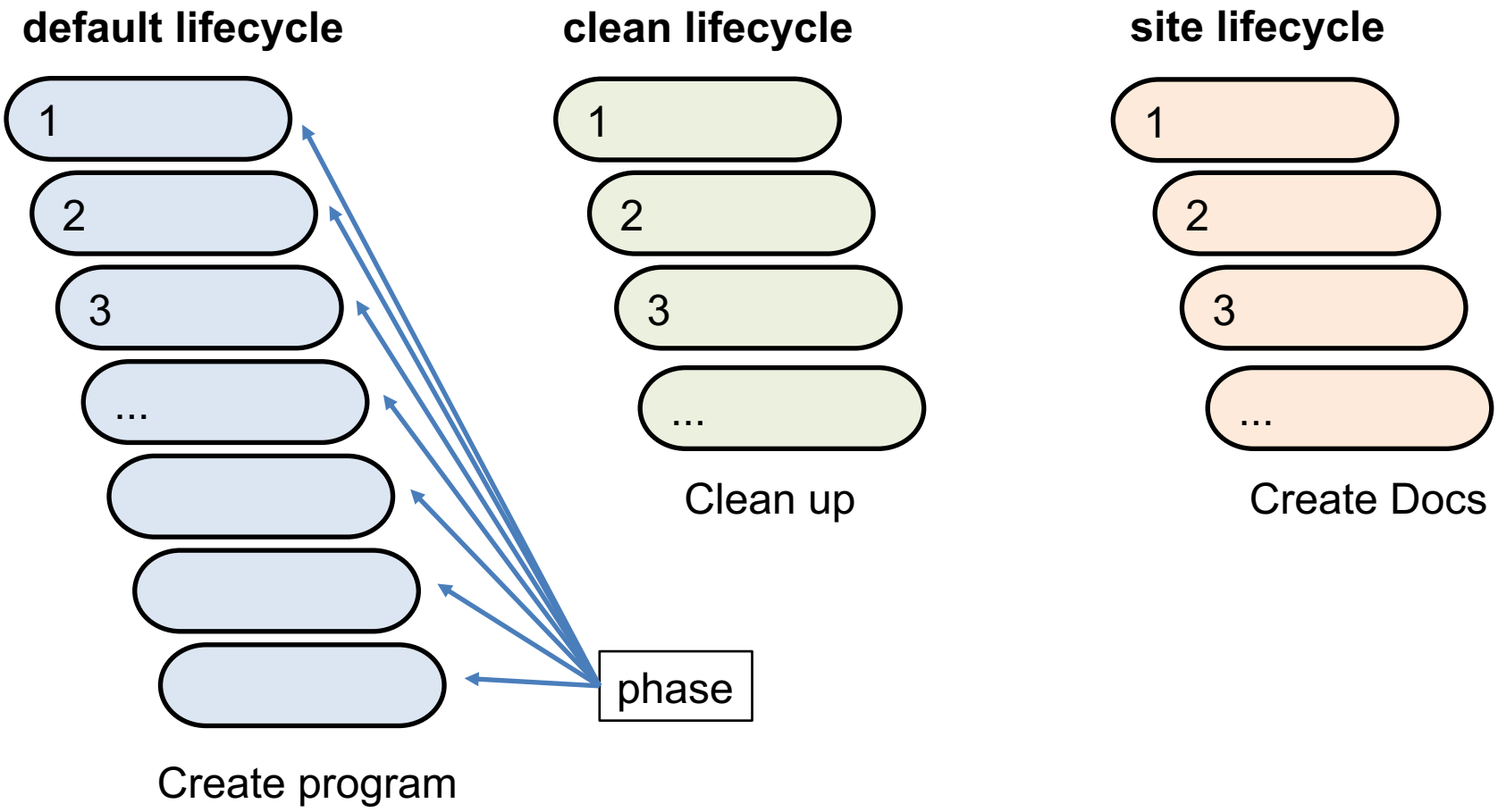


Command-Line Tool

```
C:\> mvn --version
```

Modul 14
Maven core concept

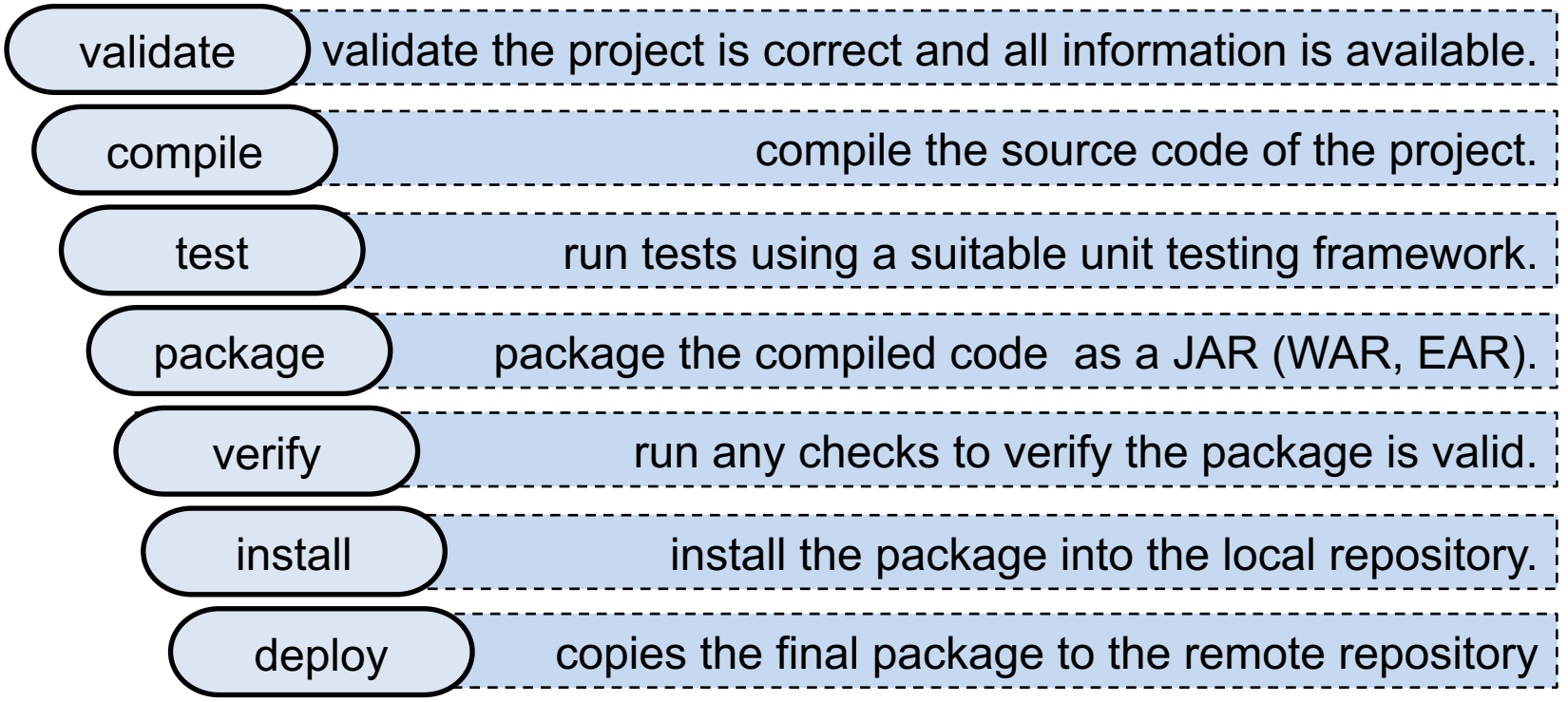
Three build-in lifecycles



Modul 14
Maven default lifecycle

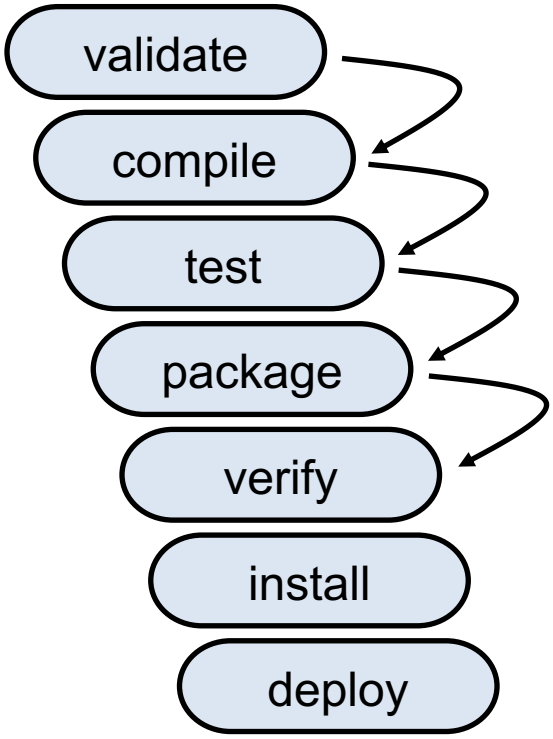
The core lifecycle consists of 7 phases. The full lifecycle consists of 22 phases.

default lifecycle (core)



"Execute" a lifecycle phase

default lifecycle (core)



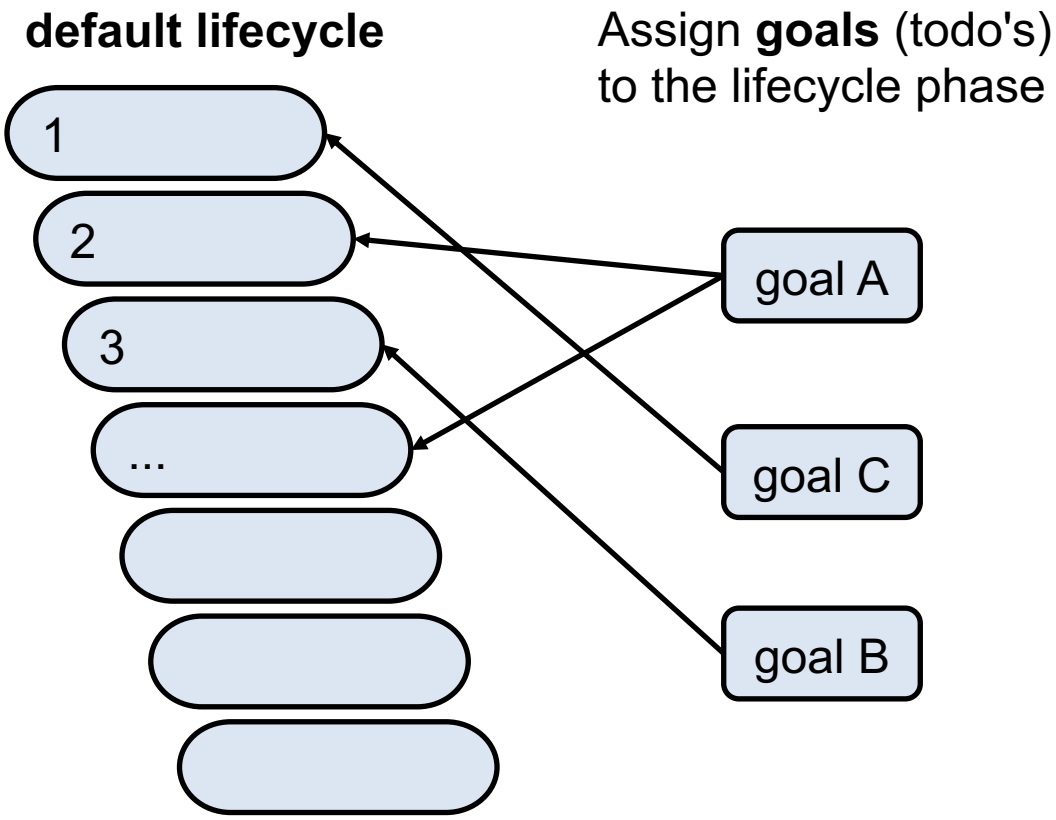
We can advise maven to execute the lifecycle phases up to a certain phase, e.g.:

```
c:\> mvn verify
```

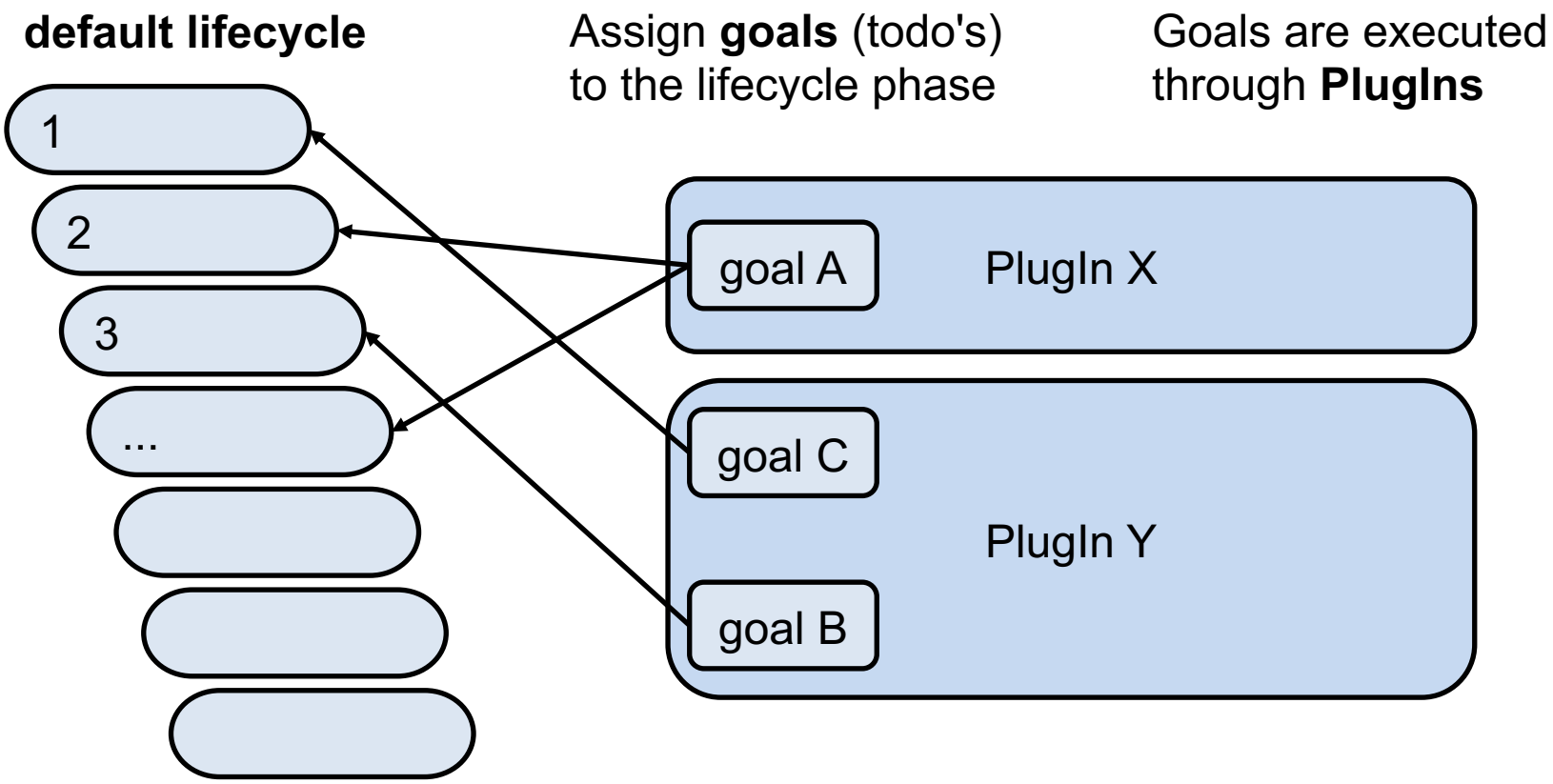
All phases up to the specified phase are executed.

You can't execute a single phase (except the first one).

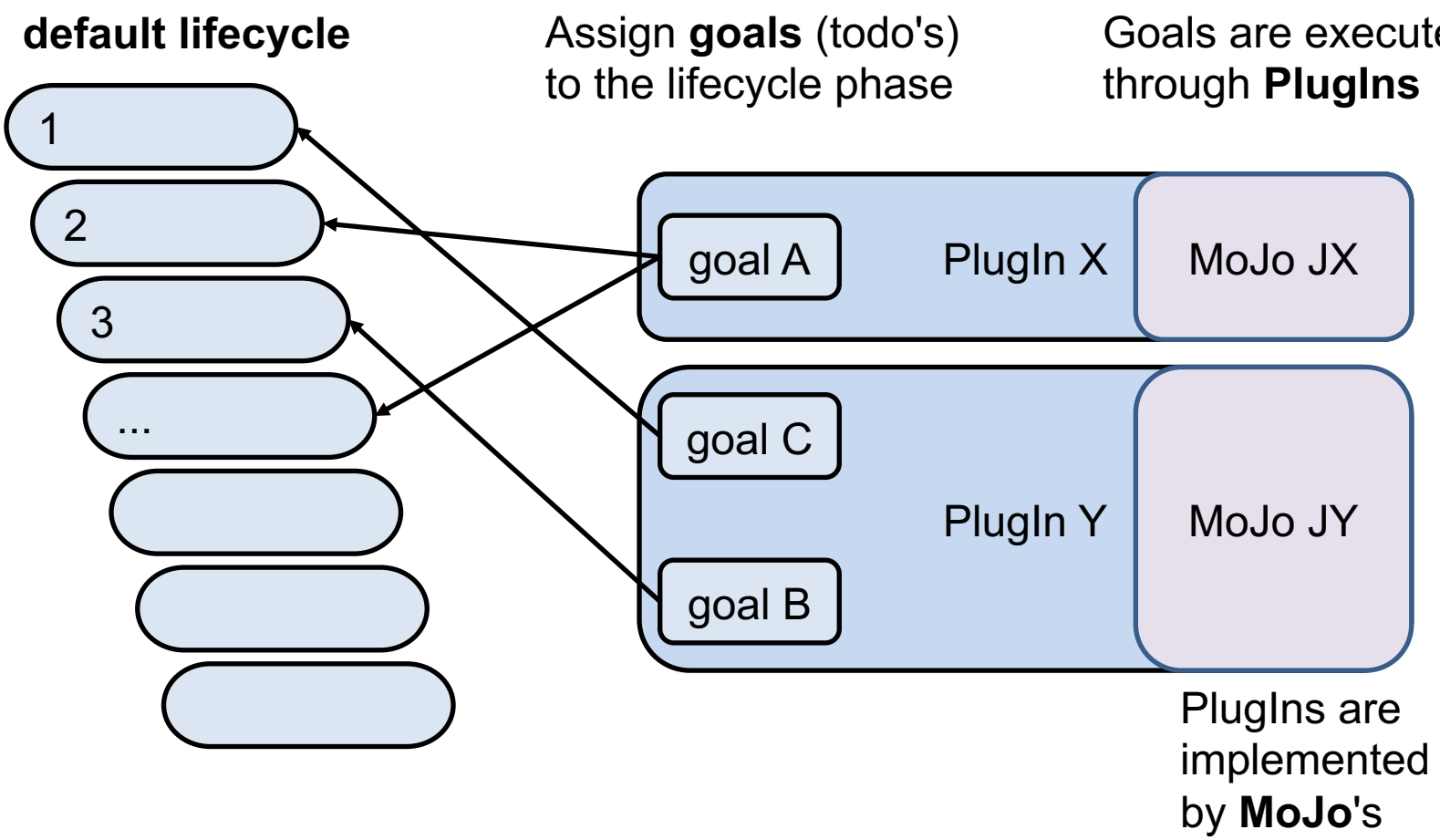
Goals


default lifecycle
Assign **goals** (todo's)
to the lifecycle phase
1
2
3
...
goal A
goal C
goal B

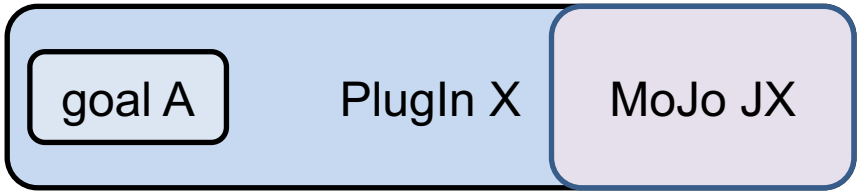
Goals


default lifecycle
Assign goals (todo's) to the lifecycle phase
Goals are executed through PlugIns
1
2
3
...
goal A
PlugIn X
goal C
PlugIn Y
goal B

Goals

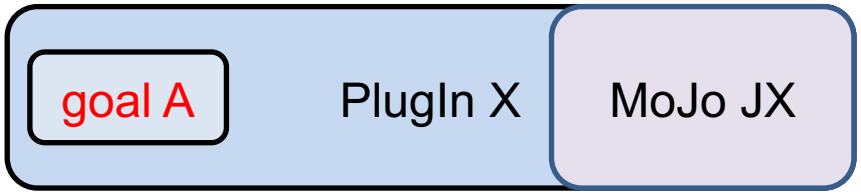

default lifecycle
Assign goals (todo's) to the lifecycle phase
Goals are executed through PlugIns
1
2
3
...
goal A
PlugIn X
MoJo JX
goal C
goal B
PlugIn Y
MoJo JY
PlugIns are implemented by MoJo's

Modul 14
Maven PlugIns



Each Mojo must specify at least one **goal, but it can be more.**

```
@Mojo( name = "goalA")
public class MojoJX extends AbstractMojo
{
  public void execute() throws MojoExecutionException
  {
    getLog().info( "Hello, world." );
  }
}
```



Each Mojo must specify at least one **goal, but it can be more.**

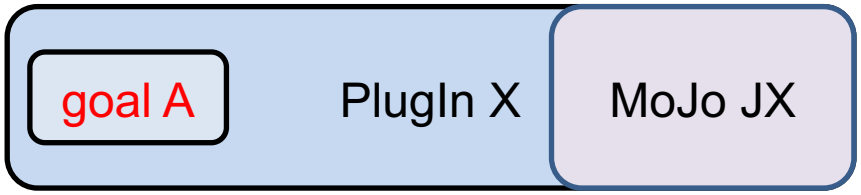
You never call the MoJo directly, you call the **PlugIn** with its **goal**.

A PlugIn is identified by **groupId:artifactId:version**

```
<plugins>
  <plugin>
   <groupId>sample.plugin</groupId>
     <artifactId>pluginx-maven-plugin</artifactId>
     <version>1.0-SNAPSHOT</version>
  </plugin>
</plugins>
```

```
C:\> mvn sample.plugin:pluginx-maven-plugin:
         1.0-SNAPSHOT:goalA
```

Modul 14
Maven PlugIns



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```
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     <version>1.0-SNAPSHOT</version>
  </plugin>
</plugins>
```
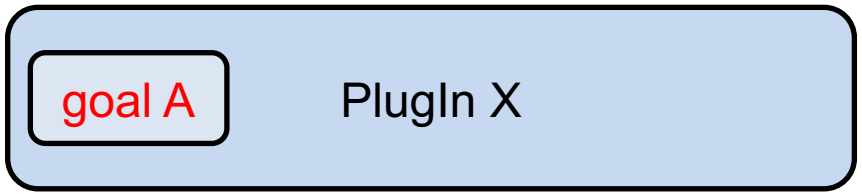
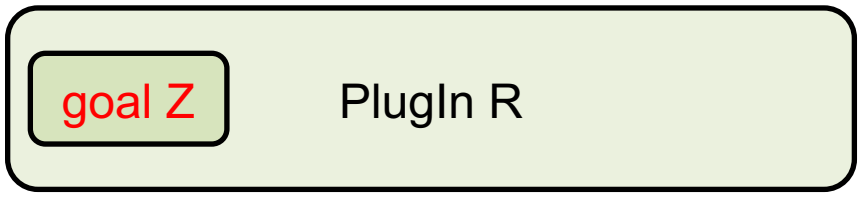

```
C:\> mvn sample.plugin:pluginx-maven-plugin:
         1.0-SNAPSHOT:goalA
```

Build plugins



Build plugins will be executed during the default-lifecycle and they should be configured in the `<build/>` element.

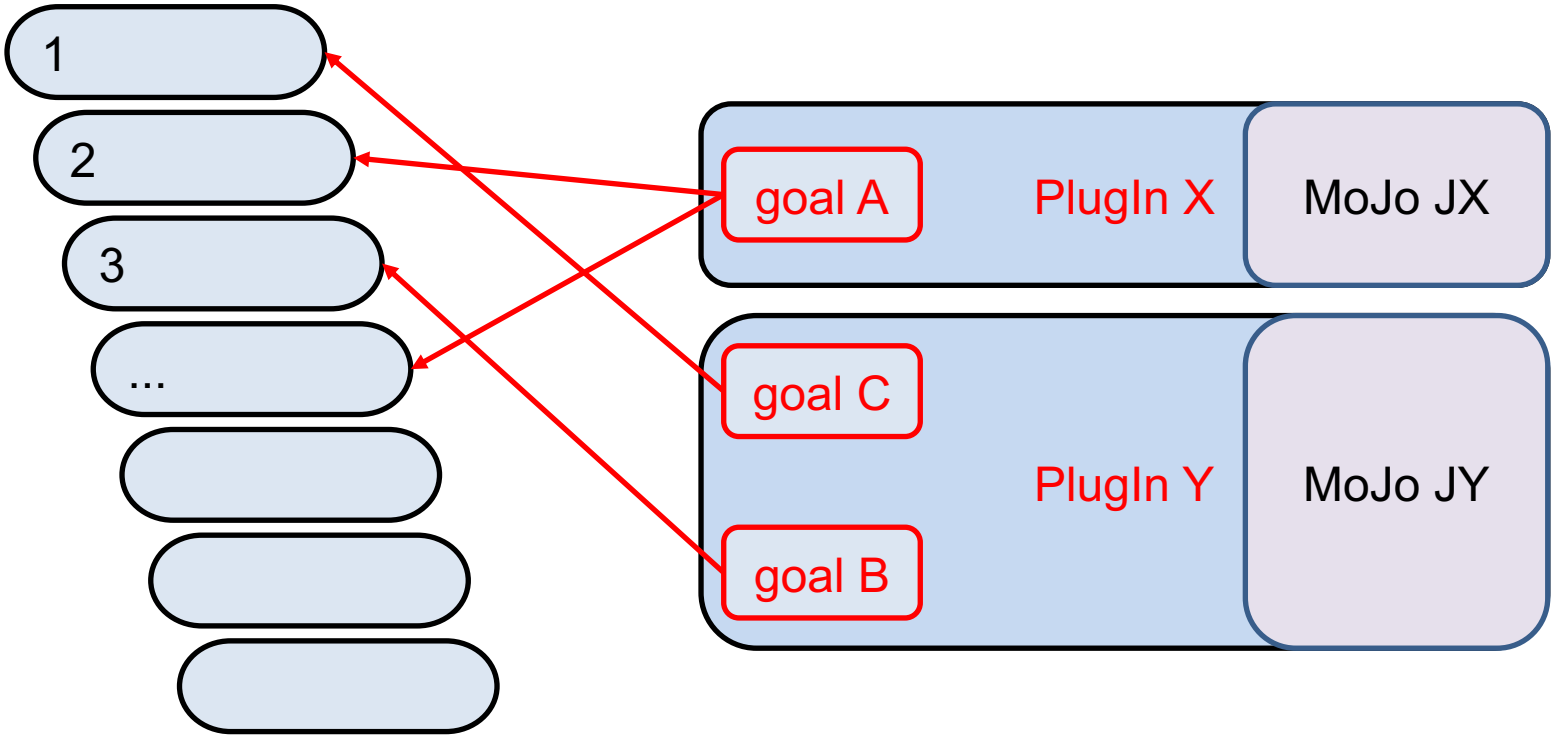
Reporting plugins



Reporting plugins will be executed during the site lifecycle and they should be configured in the `<reporting/>` element.

All plugins should have minimal required information:
groupId, **a**rtifactId and **v**ersion (**GAV** == Maven Coordinates)

The **`pom.xml`** file is the core of a project's configuration.



Modul 14
Maven - pom.xml

The **`pom.xml`** file is the core of a project's configuration.

It defines:

- Which **PlugIns** are used

- Which **PlugIn** with which **goal** is assigned to which **phase** of the lifecycle

- Which **Dependancies** (Java-Libraries) are needed for the build (later)

- ... reporting, etc.

The **`pom.xml`** file is the core of a project's configuration.

It defines:

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- Which **dependencys** (Java-Libraries) are needed for the build (later)

- ... reporting, etc.

Modul 14
Example of pom.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns=http://maven.apache.org/POM/4.0.0 ...>

<modelVersion>4.0.0</modelVersion>                    Version of pom-file

<groupId>com.hsoffenburg</groupId>
<artifactId>M14_Empty001</artifactId>                 GAV of users artefact
<version>1.0-SNAPSHOT</version>

 <build>
   <plugins>
    <plugin>
      <groupId>org.codehaus.mojo</groupId>
      <artifactId>build-helper-maven-plugin</artifactId>   PlugIn
      <version>3.0.0</version>                             GAV
    </plugin>
   </plugins>
 </build>

</project>
```

Modul 14
Example of pom.xml

Get the PlugIns goals:

```
mvn help:describe -Dplugin=org.codehaus.mojo:build-
helper-maven-plugin -Ddetail=true
```

Run the goal 'help'

```
mvn org.codehaus.mojo:build-helper-maven-plugin:3.0.0:help
```

Shortcut per convention (prefix resolution for artefact ID):
`maven-${prefix}-plugin` or **`${prefix}-maven-plugin`**
can be used: **`${prefix}`**.
For often used artefacts, the GroupID and Version is preset in settings.xml and can be omitted.

Run the goal 'help'

```
mvn build-helper:help
```

The **`pom.xml`** file is the core of a project's configuration.

It defines:

- Which **PlugIns** are used

- Which **PlugIn** with which **goal** is assigned to which **phase** of the lifecycle

- Which **dependencys** (Java-Libraries) are needed for the build (later)

- ... reporting, etc.

Normally, Build-**PlugIns** (Goals of Build-PlugIns) are assigned to be **executed** during a certain lifecycle **phase**.

```
<plugin>
  <groupId>org.codehaus.mojo</groupId>
  <artifactId>build-helper-maven-plugin</artifactId>
  <version>3.0.0</version>

    <executions>
      <execution>
        <id>execution1</id>
        <phase>validate</phase>
        <goals>
          <goal>help</goal>
        </goals>
      </execution>
    </executions>

</plugin>
```

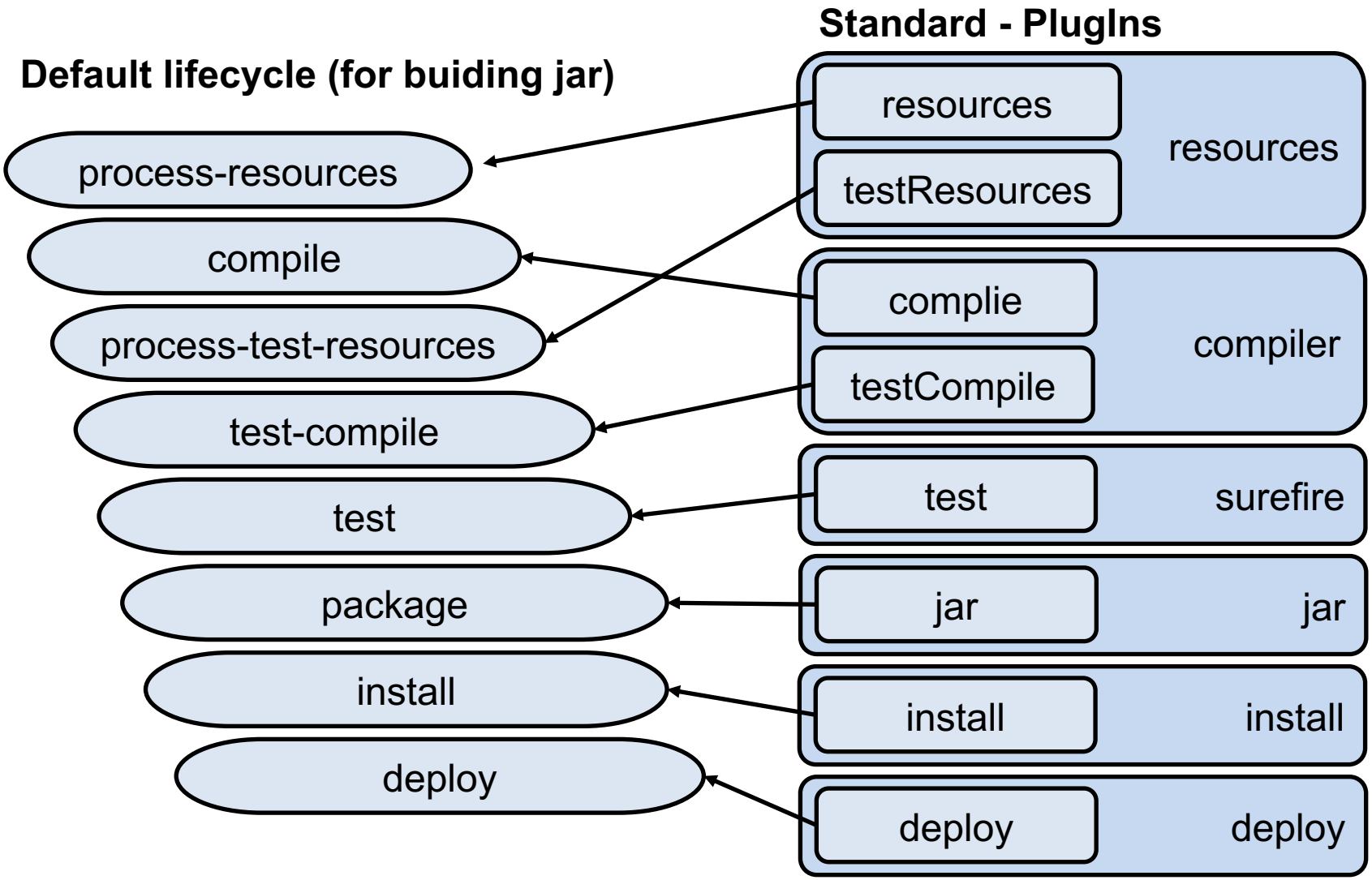
Which PlugIn ...

...in which phase to execute ...

... with which goal

```
C:\> mvn validate
```

Modul 14
Standard PlugIn assignment for building a JAR



Modul 14
Standard PlugIn assignment for building a JAR

Example: Add the resources-goal for phase process-resources

```
<plugin>
    <groupId>org.apache.maven.plugins</groupId>
    <artifactId>maven-resources-plugin</artifactId>
    <version>3.1.0</version>
    <executions>
       <execution>
          <phase>process-resources</phase>
          <goals>
             <goal>resources</goal>
          </goals>
        </execution>
     </executions>

</plugin>
```

Modul 14
Standard PlugIn assignment for building a JAR

Example: Add the resources-goal for phase process-resources

```
<plugin>
    <groupId>org.apache.maven.plugins</groupId>
    <artifactId>maven-resources-plugin</artifactId>
    <version>3.1.0</version>

</plugin>
```

This is default setting of the PlugIn

Modul 14
Standard PlugIn assignment for building a JAR

Example: Add the compile-goal for phase complie

```
<plugin>
 <groupId>org.apache.maven.plugins</groupId>
 <artifactId>maven-compiler-plugin</artifactId>
 <version>3.8.0</version>
   <configuration>
    <source>1.8</source>
    <target>1.8</target>
   </configuration>
   <executions>
     <execution>
     <phase>compile</phase>
     <goals>
        <goal>compile</goal>
     </goals>
    </execution>
   </executions>
</plugin>
```

Modul 14
Standard PlugIn assignment for building a JAR

Example: Add the compile-goal for phase complie

```
<plugin>
 <groupId>org.apache.maven.plugins</groupId>
 <artifactId>maven-compiler-plugin</artifactId>
 <version>3.8.0</version>
   <configuration>
    <source>1.8</source>
    <target>1.8</target>
   </configuration>
</plugin>
```

This is default setting of the PlugIn

Modul 14
Standard PlugIn assignment for building a JAR

```
<build>
  <plugins>
     <plugin>
       <groupId>org.apache.maven.plugins</groupId>
       <artifactId>maven-resources-plugin</artifactId>
        <version>3.1.0</version>
     </plugin>

     <plugin>
       <groupId>org.apache.maven.plugins</groupId>
       <artifactId>maven-compiler-plugin</artifactId>
       <version>3.8.0</version>
       <configuration>
          <source>1.8</source>
          <target>1.8</target>
       </configuration>
     </plugin>

     ...

  <plugins>
<build>
```

Modul 14
Standard PlugIn assignment for building a JAR

All 8 goals becomes **default** setting if you use the tag

```
<packaging>jar</packaging>
```

Modul 14
Standard PlugIn assignment for building a JAR

Complete pom.xml for JAR

```
<?xml version="1.0" encoding="UTF-8"?>
<project ...>

    <modelVersion>4.0.0</modelVersion>
    <groupId>com.hsoffenburg</groupId>
    <artifactId>M14_Empty001</artifactId>
    <version>1.0-SNAPSHOT</version>
    <packaging>jar</packaging>          //Default
    <build>
        <plugins>

        </plugins>
    </build>
</project>
```

Modul 14
Standard PlugIn assignment for building a JAR

Complete pom.xml for JAR

```
<?xml version="1.0" encoding="UTF-8"?>
<project ...>

    <modelVersion>4.0.0</modelVersion>
    <groupId>com.hsoffenburg</groupId>
    <artifactId>M14_Empty001</artifactId>
    <version>1.0-SNAPSHOT</version>

</project>
```

Use *properties* for Plugin configuration

```
<properties>
  <maven.compiler.source>1.8</maven.compiler.source>
</properties>

 ... ${maven.compiler.source} ...  //access property
```

Modul 14
Standard PlugIn assignment for building a JAR

But …

```
wiggel$ java -jar ./target/M14_Empty001-1.0-SNAPSHOT.jar

Fehler: Hauptklasse jar konnte nicht gefunden oder
geladen werden
```

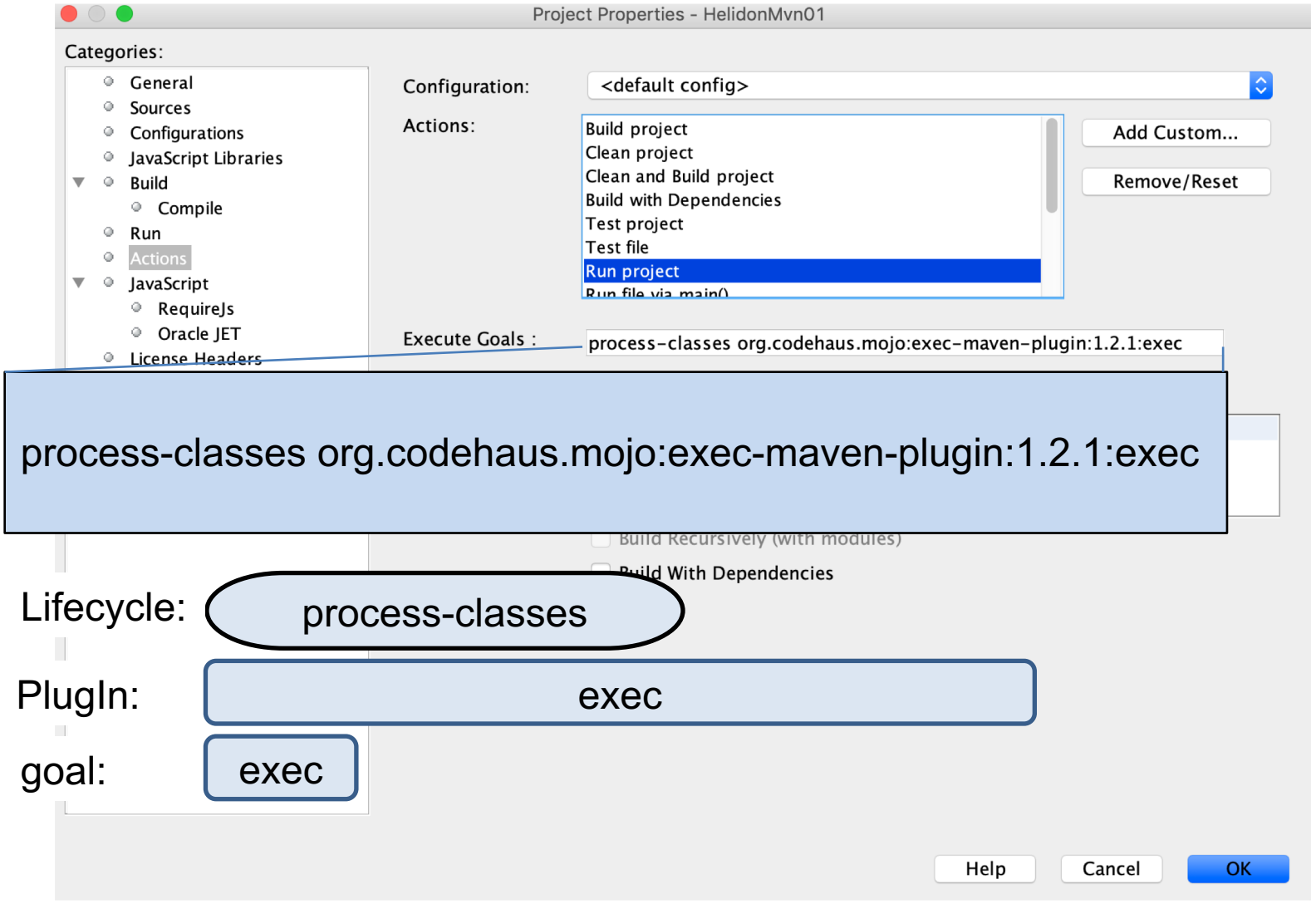
…, so add Main-Class in Manifest-Tag of jar-PlugIn:

```
 <plugin>
    <artifactId>maven-jar-plugin</artifactId>
    <version>3.1.2</version>
    <configuration>
      <archive>
        <manifest>
          <mainClass>hsog.m14_empty001.HalloW</mainClass>
        </manifest>
      </archive>
    </configuration>
</plugin>
```

```
C:\> java -jar ./target/M14_Empty001-1.0-SNAPSHOT.jar
```

Maven – IDE Integration

Maven – IDE Integration



process-classes org.codehaus.mojo:exec-maven-plugin:1.2.1:exec

Lifecycle: process-classes

PlugIn: exec

goal: exec

Maven – Simulate IDE integration by hand (CLI)

Start via exec-maven-plugin

```
 <plugin>
   <groupId>org.codehaus.mojo</groupId>
   <artifactId>exec-maven-plugin</artifactId>
   <version>1.6.0</version>
      <executions>
        <execution>
           <goals>
             <goal>java</goal>
           </goals>
        </execution>
      </executions>
     <configuration>
       <mainClass>m14_empty001.HalloW</mainClass>
     </configuration>
</plugin>
```

```
c:\> mvn exec:java
```

Maven
Dependencies

Maven Dependencies

With *ant* download all required libraries by hand

```
<dependency>
<groupId>io.helidon.microprofile.bundles</groupId>
<artifactId>helidon-microprofile-1.2</artifactId>
</dependency>
```

- io.helidon.health » helidon-health-checks
- io.helidon.microprofile » helidon-microprofile-fault-tolerance
- io.helidon.microprofile.bundles » helidon-microprofile-1.1
- io.helidon.microprofile.health » helidon-microprofile-health
- io.helidon.microprofile.jwt » helidon-microprofile-jwt-auth-cdi
- io.helidon.microprofile.metrics » helidon-microprofile-metrics

Transitive Dependencies

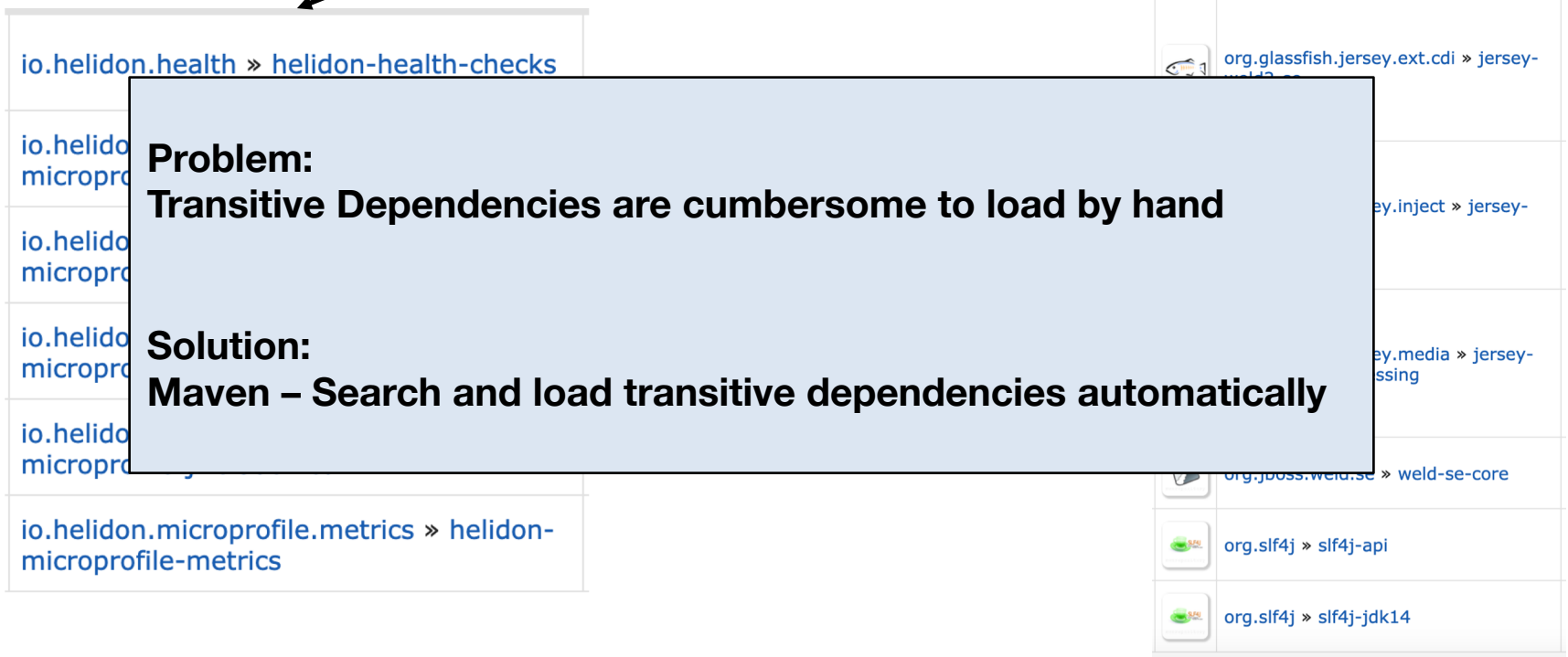
- io.helidon.microprofile.config » helidon-microprofile-config
- io.helidon.microprofile.config » helidon-microprofile-config-cdi
- io.helidon.microprofile.server » helidon-microprofile-server

- org.glassfish » javax.json
- org.glassfish.jersey.ext.cdi » jersey-weld2-se
- org.glassfish.jersey.inject » jersey-hk2
- org.glassfish.jersey.media » jersey-media-json-processing
- org.jboss.weld.se » weld-se-core
- org.slf4j » slf4j-api
- org.slf4j » slf4j-jdk14

Maven Dependencies

With *ant* download all required libraries by hand

```
<dependency>
<groupId>io.helidon.microprofile.bundles</groupId>
<artifactId>helidon-microprofile-1.2</artifactId>
</dependency>
```



Problem:
Transitive Dependencies are cumbersome to load by hand

Solution:
Maven – Search and load transitive dependencies automatically

Dependencies
pom.xml

The **`pom.xml`** file is the core of a project's configuration.

It defines:

- Which **PlugIns** are used

- Which **PlugIn** with which **goal** is assigned to which **phase** of the lifecycle

- Which **dependencies** (Java-Libraries) are needed for the build (now)

- ... reporting, etc.

Dependencies
pom.xml

List required libraries in pom.xml.

```
</project>
   ...
   <dependencies>
     <dependency>
        <groupId>io.helidon.microprofile.bundles</groupId>
        <artifactId>helidon-microprofile-1.2</artifactId>
        <version>1.0.2</version>
      </dependency>
    </dependencies>
</project>
```

Maven automatically searches and loads the libs:

Search `helidon-microprofile-1.2` in Maven local repository.

Search `helidon-microprofile-1.2` in Maven central repository.

Search `helidon-microprofile-1.2` in Maven remote repository (if remote repository defined in pom.xml).

Dependencies
Example pom.xml for using helidon 1.2

```
<?xml version="1.0" encoding="UTF-8 …">
    <modelVersion>4.0.0</modelVersion>
    <groupId>com.hsoffenburg</groupId>
    <artifactId>HelidonMvn01</artifactId>
    <version>1.0-SNAPSHOT</version>
    <packaging>jar</packaging>

    <dependencies>
        <dependency>
         <groupId>io.helidon.microprofile.bundles</groupId>
            <artifactId>helidon-microprofile-1.2</artifactId>
            <version>1.0.2</version>
        </dependency>
    </dependencies>
</project>
```

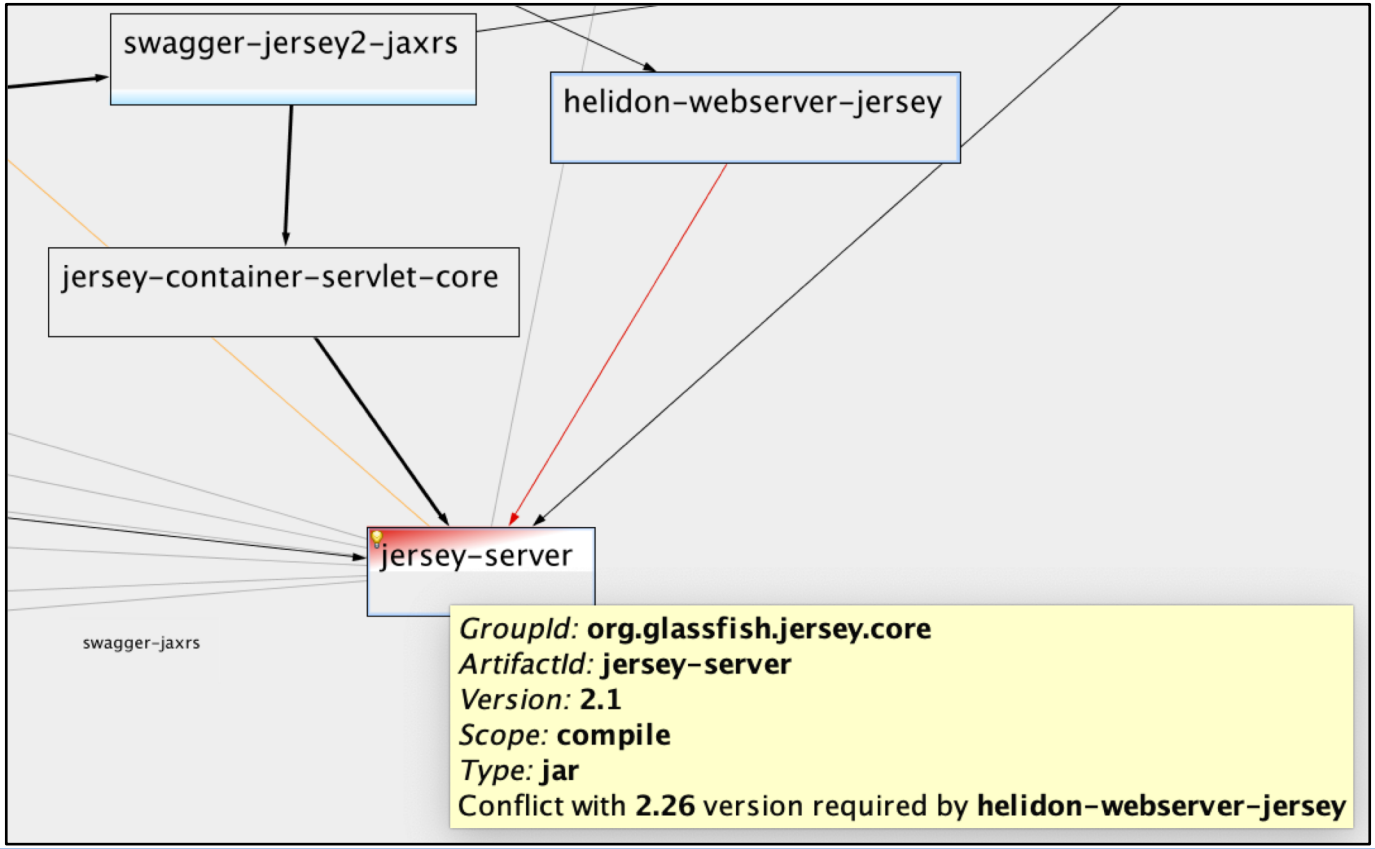
Dependencies
Example pom.xml for using helidon 1.2

Adding further dependencies is easy …

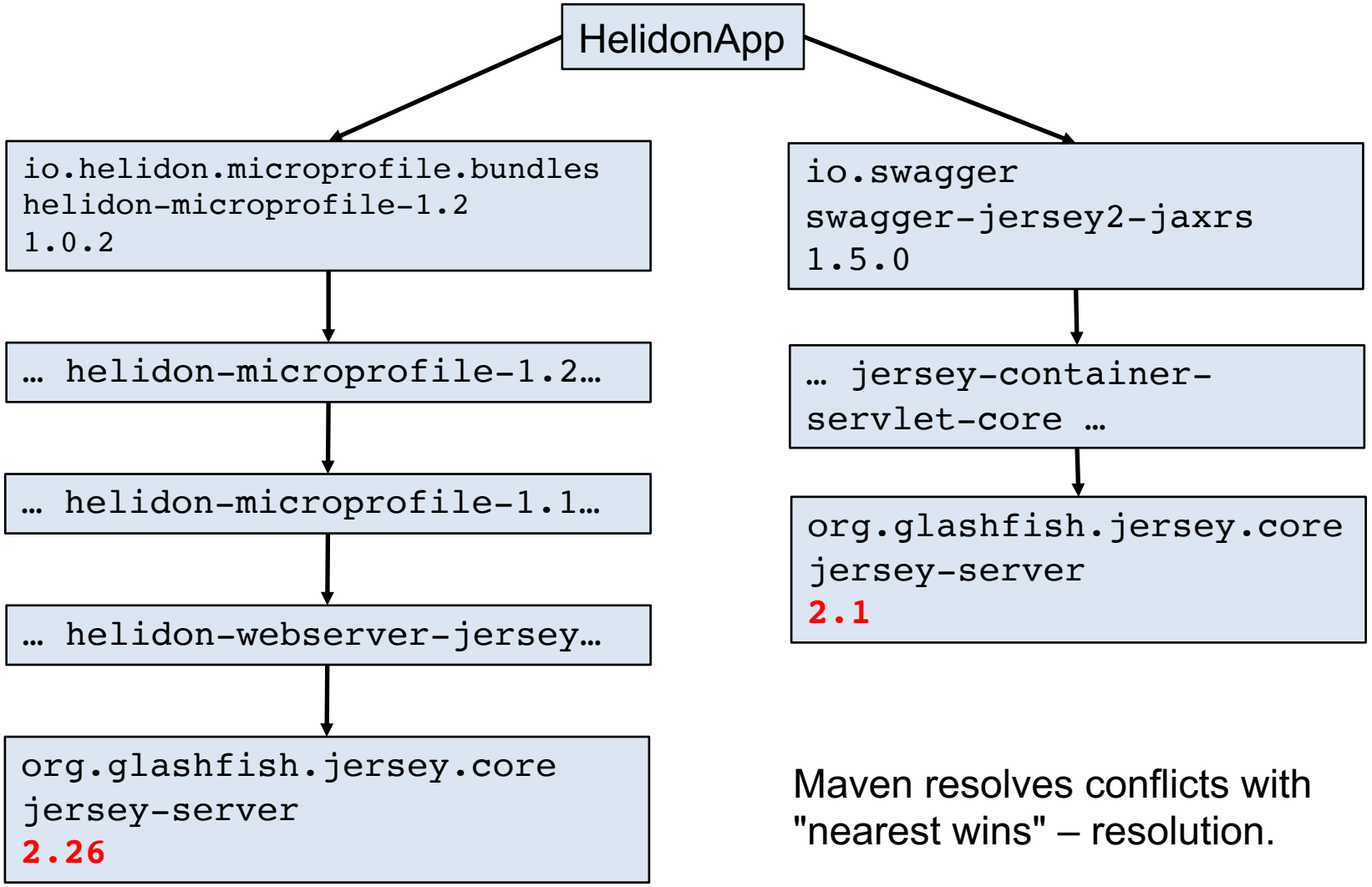
```
<?xml version="1.0" encoding="UTF-8 …">
    ...
    <dependencies>
        <dependency>
         <groupId>io.helidon.microprofile.bundles</groupId>
            <artifactId>helidon-microprofile-1.2</artifactId>
            <version>1.0.2</version>
        </dependency>

         <dependency>
            <groupId>io.swagger</groupId>
            <artifactId>swagger-jersey2-jaxrs</artifactId>
            <version>1.5.0</version>
        </dependency>

    </dependencies>
</project>
```

Dependencies
Example pom.xml for using helidon 1.2

Adding further dependencies is easy … but in this example, we get an (runtime) error! Using the dependency graph shows a version conflict between to artefacts:

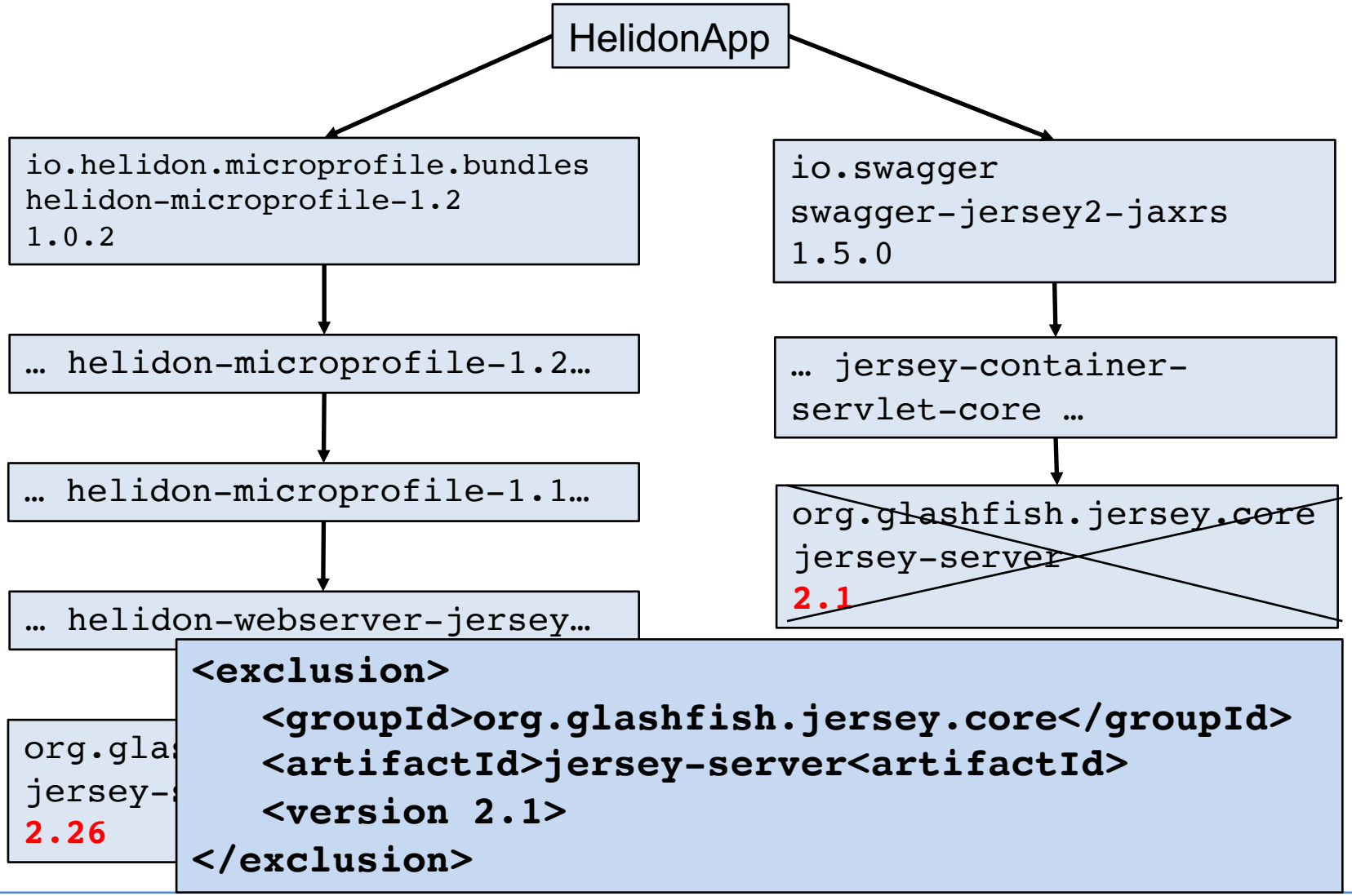


Dependencies
Version conflicts

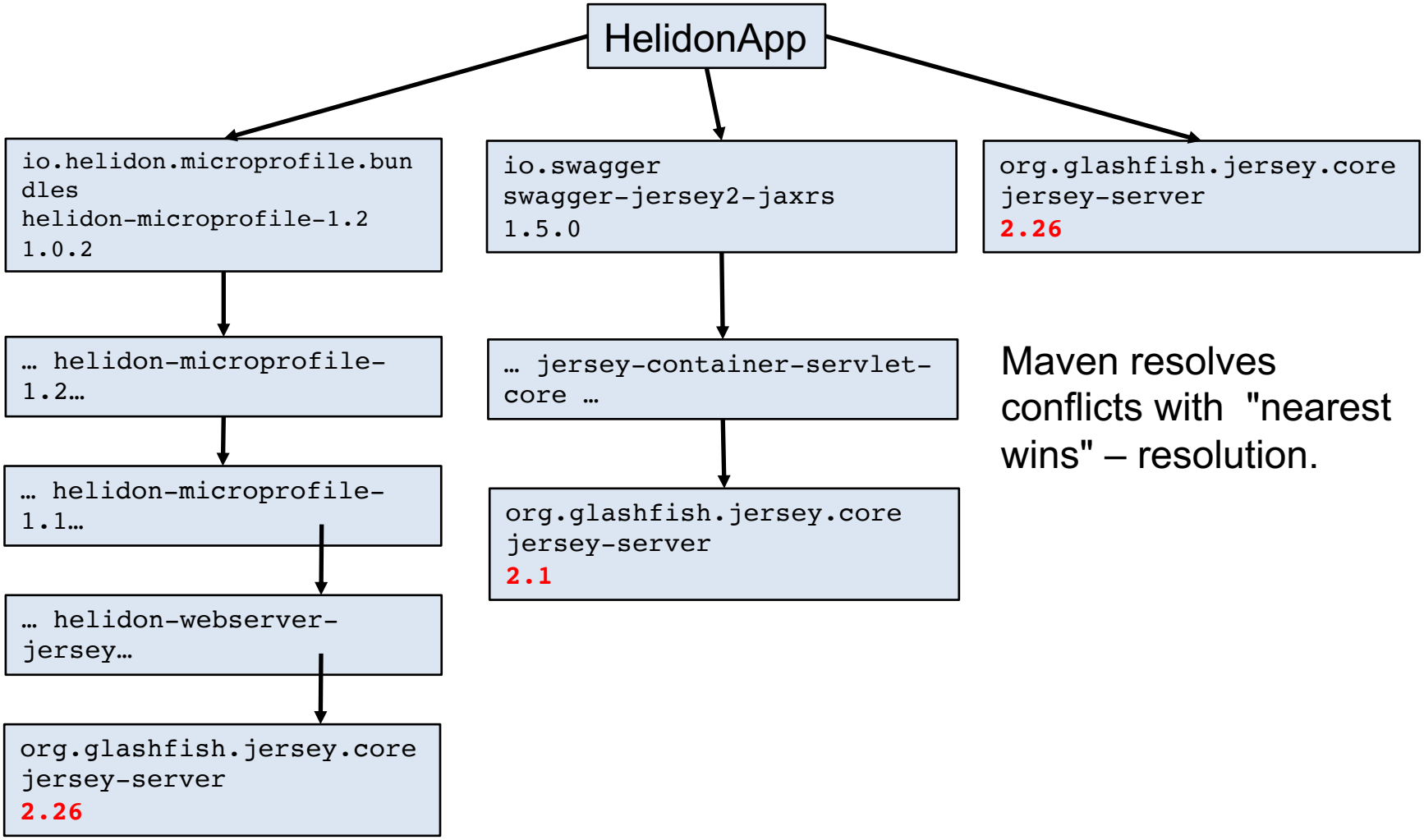


Maven resolves conflicts with "nearest wins" – resolution.

Dependencies
Solution 1 – Exclude Artefact

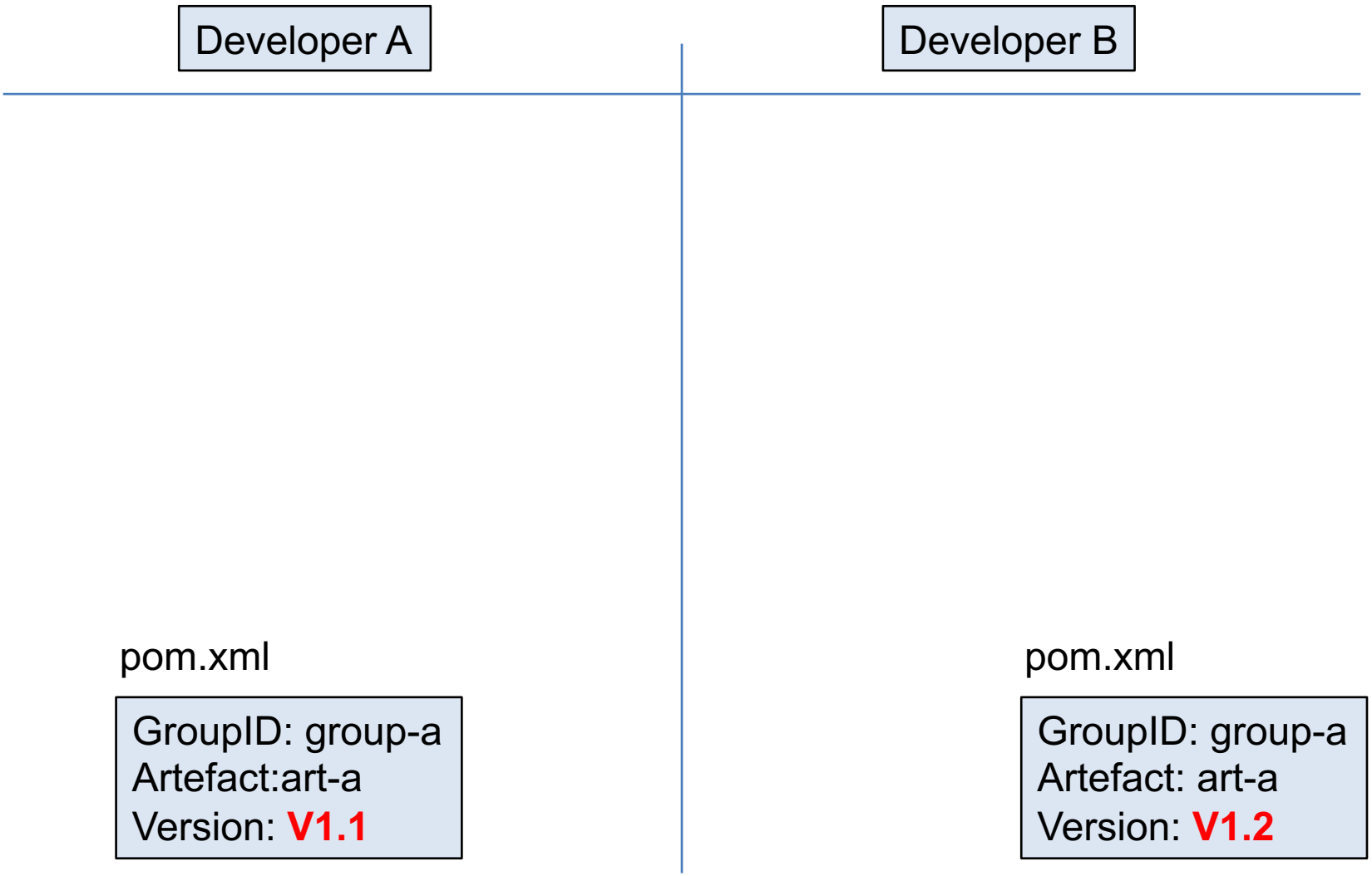


Dependencies
Solution 2 – Include as a direct dependency

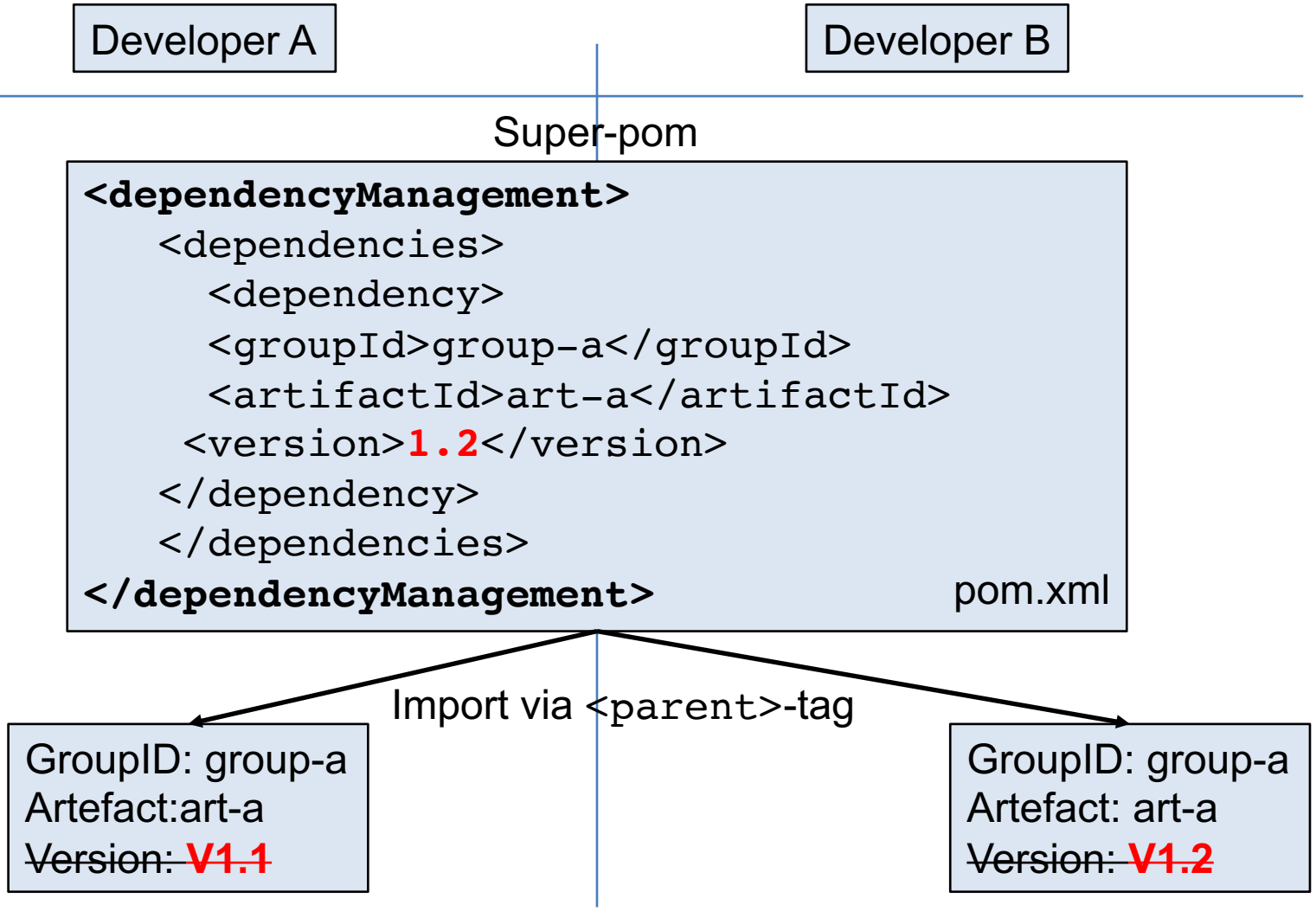


Maven resolves conflicts with "nearest wins" – resolution.

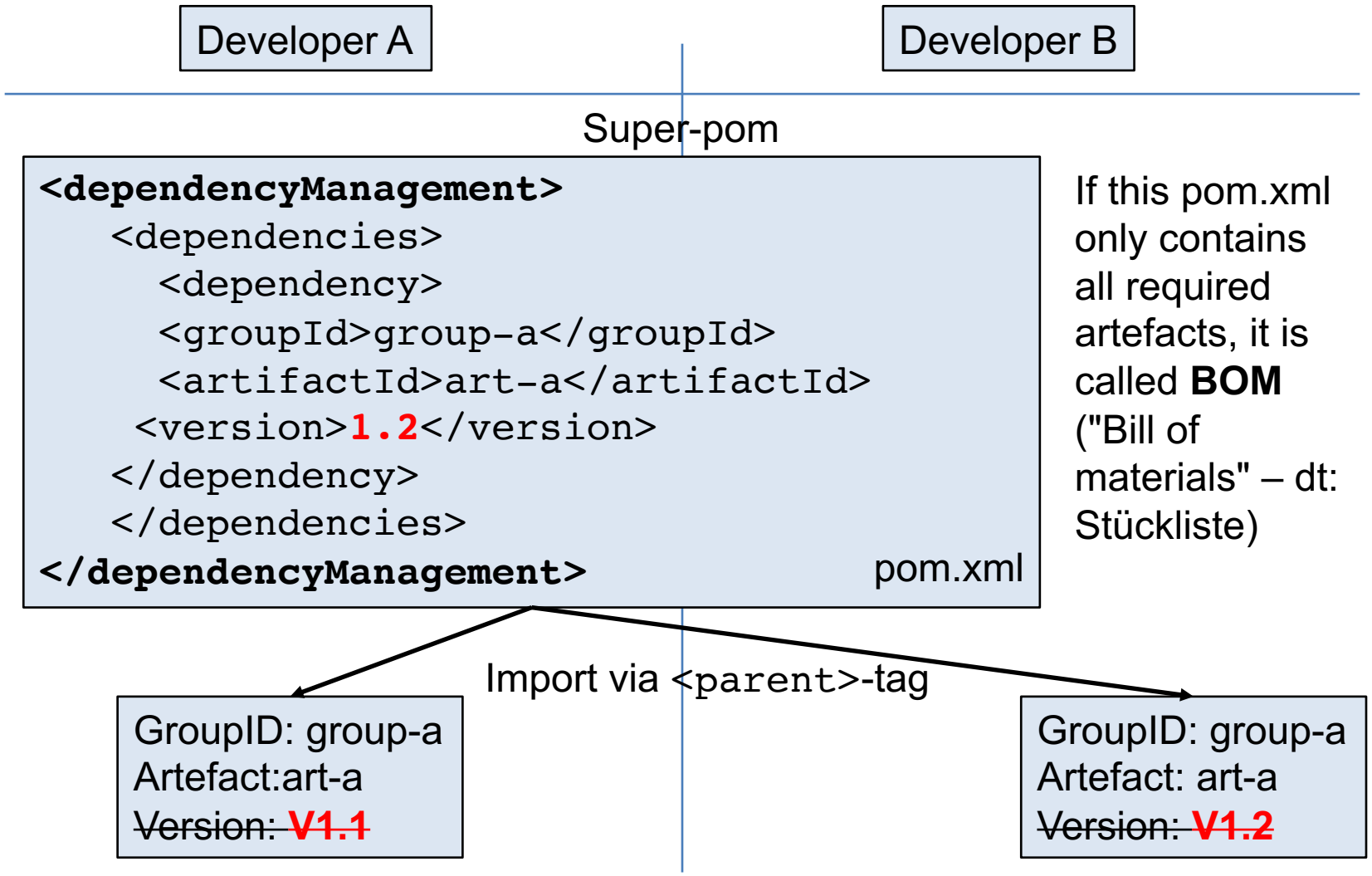
Avoiding Version Conflicts
Dependency Management



Avoiding Version Conflicts
Dependency Management



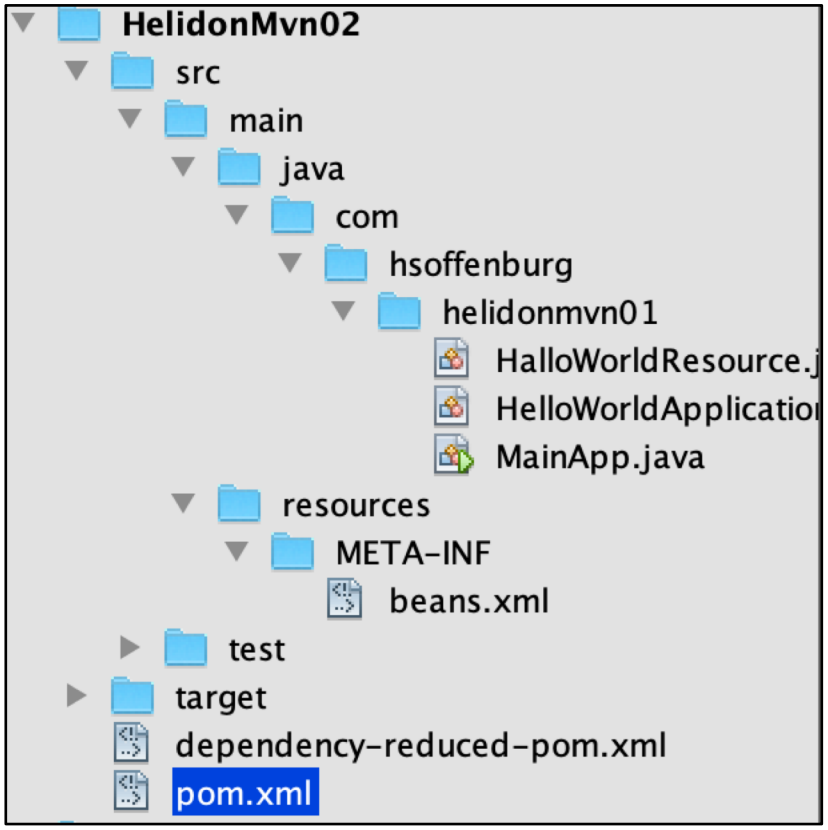
Avoiding Version Conflicts
BOM-file



Maven Archetype

Maven Archetype

For developing java-projects, we need a certain structure of folders and a couple of files.



For generating this folder structure, we can use a pre-defined template: a *maven archetype*.

This template can be customized (i.e. groupID, artefactID, etc.)

To generate the structure, use the PlugIn *archetype* with the goal *generate*:

```
mvn archetype:generate …
```

Maven Archetype for simple JAR

```
archetype:generate
    -DgroupId={project-packaging}
    -DartifactId={project-name}
    -DarchetypeArtifactId={maven-template}
    -DinteractiveMode=false
```

```
mvn archetype:generate
      -DgroupId=com.mkyong.hashing
      -DartifactId=java-project
      -DarchetypeArtifactId=maven-archetype-quickstart
      -DinteractiveMode=false
```

Appendix

List Table of PlugIns, ExecutionIDs and Phases

```
<plugin>
        <groupId>fr.jcgay.maven.plugins</groupId>
        <artifactId>buildplan-maven-plugin</artifactId>
        <version>1.3</version>
</plugin>
```

```
c:\> mvn buildplan:list-phase
```

Appendix

Disable default phase of default goal

```
<plugin>
      <groupId>org.apache.maven.plugins</groupId>
      <artifactId>maven-compiler-plugin</artifactId>
        <executions>
           <execution>
            <id>default-compile</id>
            <phase>none</phase>
           </execution>
        </executions>
</plugin>
```

Appendix

Execute main() in jar

```
<plugin>
  <groupId>org.codehaus.mojo</groupId>
  <artifactId>exec-maven-plugin</artifactId>
  <version>1.6.0</version>
     <executions>
        <execution>
         <goals>
           <goal>java</goal>
          </goals>
         </execution>
       </executions>
       <configuration>
         <mainClass>hsog.m14_empty001.HalloW</mainClass>
       </configuration>
 </plugin>
```

Appendix
Find / check dependancies with enforcer:enforce

```
<plugin> <groupId>org.apache.maven.plugins</groupId>
    <artifactId>maven-enforcer-plugin</artifactId>
    <version>1.4.1</version>
    <executions>
      <execution>
        <id>default-cli</id>
        <phase>dont-execute</phase>
        <configuration>
          <rules>
            <dependencyConvergence/>
          </rules>
        </configuration>
        <goals>
          <goal>enforce</goal>
        </goals>
      </execution>
    </executions>
</plugin>
```

Appendix
Speed up Weld with jandex

```
<plugin>
    <groupId>org.jboss.jandex</groupId>
    <artifactId>jandex-maven-plugin</artifactId>
    <version>1.0.5</version>
    <executions>
        <execution>
            <id>make-index</id>
            <goals>
                <goal>jandex</goal>
            </goals>
            <phase>process-classes</phase>
        </execution>
    </executions>
</plugin>
```

Appendix
Generate executable fat-jar with capsulate:build

```
<plugin>
    <groupId>com.github.chrisdchristo</groupId>
    <artifactId>capsule-maven-plugin</artifactId>
    <executions>
        <execution>
            <goals>
                <goal>build</goal>
            </goals>
            <configuration>
              <appClass>helidonmvn01.MainApp</appClass>
                <type>thin</type>
            </configuration>
        </execution>
    </executions>
</plugin>
```