

Buildtools 2: Language specific buildtools

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Last time...

We talked about *Make* as a tool for compiling code

- ▶ We discussed how *Make* could be used to shift documents between different formats

But there is one thing *Make's* can't do...

Versioning

Modern development makes extensive use of external libraries...
But *Make* is rubbish at dealing with them:

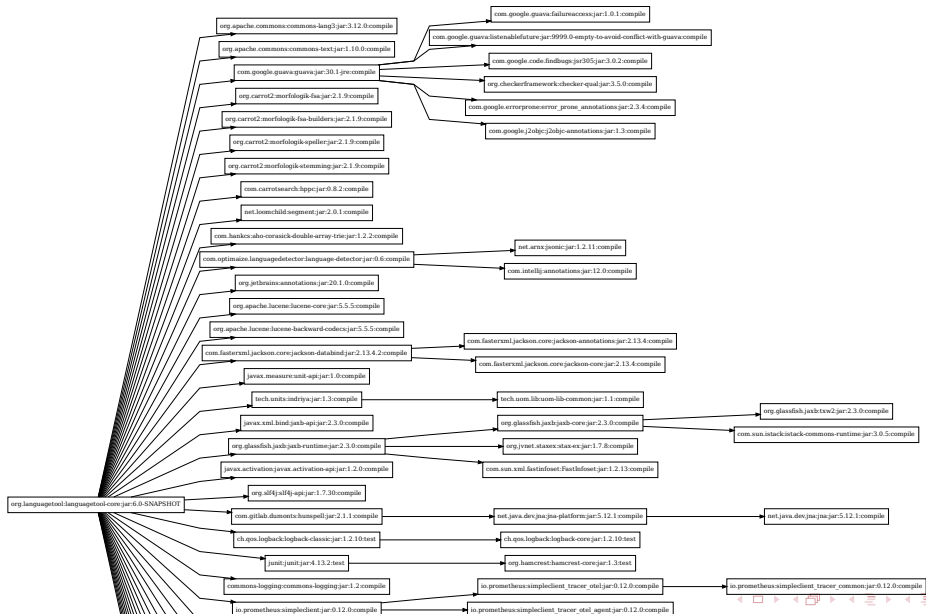
- ▶ Doesn't know how to fetch dependencies
- ▶ Doesn't track versions beyond *source is newer than object*

LanguageTool is a cool little Java grammar checker:

- ▶ How many libraries does *just the core* of the tool make use of?

```
mvn dependency:tree -D outputType=dot | dot -Tpdf
```

This is surely too many?



In the old days...

Traditionally you'd have to go download all the dependencies by hand...

- ▶ And then compile and install them
- ▶ Very tedious and error prone

So we automated it!

Modern build tooling

(Almost) every language comes with its own library management tooling

- ▶ Lets developers specify dependencies
- ▶ Tells compiler how to rebuild the project

...which means *for every language you use you need to learn its build tools...*

- ▶ Yay?

(Honestly, I still use *Make* but I'm old and cantankerous)

So now we have...

Commonlisp ASDF and Quicklisp

Go Gobuild

Haskell Cabal

Java Ant, Maven, Gradle...

JavaScript NPM

Perl CPAN

Python Distutils and requirements.txt

R CRAN

Ruby Gem

Rust Cargo

L^AT_EX CTAN and TeXlive

...and *many* more.

And they're all different

Very little similarity between *any* of them.

- ▶ You need to learn the ones you use.
- ▶ We'll play in the labs with *Maven* for Java a little bit

Maven Quickstart

```
mkdir /tmp/src
cd /tmp/src
mvn archetype:generate \
  -DgroupId=uk.ac.bristol.cs \
  -DartifactId=hello \
  -DarchetypeArtifactId=maven-archetype-quickstart \
  -DinteractiveMode=false
```

```
INFO Scanning for projects\ldots{}
```

```
INFO
```

```
INFO -----< org.apache.maven:standalone-pom >-----
```

```
INFO Building Maven Stub Project (No POM) 1
```

```
INFO -----[ pom ]-----
```

```
INFO
```

```
INFO >>> maven-archetype-plugin:3.2.1:generate (default-cli) > generate-sources @ standalone-
```

```
INFO
```

```
INFO <<< maven-archetype-plugin:3.2.1:generate (default-cli) < generate-sources @ standalone-
```

```
INFO
```

```
INFO
```

```
INFO --- maven-archetype-plugin:3.2.1:generate (default-cli) @ standalone-pom ---
```

```
INFO Generating project in Batch mode
```

```
INFO -----
```

...and after spewing all that...

```
find /tmp/src -type f
```

- ▶ ("/tmp/src/hello/pom.xml")
- ▶ ("/tmp/src/hello/src/main/java/uk/ac/bristol/cs/App.java")
- ▶ ("/tmp/src/hello/src/test/java/uk/ac/bristol/cs/AppTest.java")

pom.xml

```
<project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/maven-v4_0_0.xsd">
  <modelVersion>4.0.0</modelVersion>
  <groupId>uk.ac.bristol.cs</groupId>
  <artifactId>hello</artifactId>
  <packaging>jar</packaging>
  <version>1.0-SNAPSHOT</version>
  <name>hello</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>
```

And if we try and build...

```
mvn package
```

```
INFO Scanning for projects\ldots{}
```

```
INFO
```

```
INFO -----< uk.ac.bristol.cs:hello >-----
```

```
INFO Building hello 1.0-SNAPSHOT
```

```
INFO -----[ jar ]-----
```

```
INFO
```

```
INFO --- maven-resources-plugin:2.6:resources (default-resources) @ hello ---
```

```
WARNING Using platform encoding (US-ASCII actually) to copy filtered resources, i.e. build is
```

```
INFO skip non existing resourceDirectory /tmp/src/hello/src/main/resources
```

```
INFO
```

```
INFO --- maven-compiler-plugin:3.1:compile (default-compile) @ hello ---
```

```
INFO Changes detected - recompiling the module!
```

```
WARNING File encoding has not been set, using platform encoding US-ASCII, i.e. build is platf
```

```
INFO Compiling 1 source file to /tmp/src/hello/target/classes
```

```
INFO -----
```

```
ERROR COMPILATION ERROR :
```

```
INFO -----
```

```
ERROR Source option 5 is no longer supported. Use 7 or later.
```

```
ERROR Target option 5 is no longer supported. Use 7 or later.
```

```
INFO 2 errors
```

Lets fix that for it shall we?

(It's either that or installing an ancient Java compiler...)

```
ed /tmp/src/hello/pom.xml <<EOF
```

```
10i
```

```
  <properties>
```

```
    <maven.compiler.source>17</maven.compiler.source>
```

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

```
  </properties>
```

```
•
```

```
wq
```

```
EOF
```

```
639 778
```

And if we try and build, again...

```
mvn package
```

```
INFO Scanning for projects\ldots{}
```

```
INFO
```

```
INFO -----< uk.ac.bristol.cs:hello >-----
```

```
INFO Building hello 1.0-SNAPSHOT
```

```
INFO -----[ jar ]-----
```

```
INFO
```

```
INFO --- maven-resources-plugin:2.6:resources (default-resources) @ hello ---
```

```
WARNING Using platform encoding (US-ASCII actually) to copy filtered resources, i.e. build is
```

```
INFO skip non existing resourceDirectory /tmp/src/hello/src/main/resources
```

```
INFO
```

```
INFO --- maven-compiler-plugin:3.1:compile (default-compile) @ hello ---
```

```
INFO Changes detected - recompiling the module!
```

```
WARNING File encoding has not been set, using platform encoding US-ASCII, i.e. build is platf
```

```
INFO Compiling 1 source file to /tmp/src/hello/target/classes
```

```
INFO
```

```
INFO --- maven-resources-plugin:2.6:testResources (default-testResources) @ hello ---
```

```
WARNING Using platform encoding (US-ASCII actually) to copy filtered resources, i.e. build is
```

```
INFO skip non existing resourceDirectory /tmp/src/hello/src/test/resources
```

```
INFO
```

```
INFO --- maven-compiler-plugin:3.1:testCompile (default-testCompile) @ hello ---
```

Does anyone actually know why Java stuff is so ridiculously verbose?

```
find /tmp/src -type f
```

- ▶ ("/tmp/src/hello/pom.xml")
- ▶ ("/tmp/src/hello/src/main/java/uk/ac/bristol/cs/App.java")
- ▶ ("/tmp/src/hello/src/test/java/uk/ac/bristol/cs/AppTest.java")
- ▶ ("/tmp/src/hello/target/maven-status/maven-compiler-plugin/compile/default-compile/createdFiles.lst")
- ▶ ("/tmp/src/hello/target/maven-status/maven-compiler-plugin/compile/default-compile/inputFiles.lst")
- ▶ ("/tmp/src/hello/target/maven-status/maven-compiler-plugin/testCompile/default-testCompile/createdFiles.lst")
- ▶ ("/tmp/src/hello/target/maven-status/maven-compiler-plugin/testCompile/default-testCompile/inputFiles.lst")
- ▶ ("/tmp/src/hello/target/classes/uk/ac/bristol/cs/App.class")
- ▶ ("/tmp/src/hello/target/test-classes/uk/ac/bristol/cs/AppTest.class")
- ▶ ("/tmp/src/hello/target/surefire-reports/uk.ac.bristol.cs.AppTest.txt")
- ▶ ("/tmp/src/hello/target/surefire-reports/TEST-uk.ac.bristol.cs.AppTest.xml")
- ▶ ("/tmp/src/hello/target/maven-archiver/pom.properties")
- ▶ ("/tmp/src/hello/target/hello-1.0-SNAPSHOT.jar")

Other useful commands

`mvn test` run the test suite

`mvn install` install the JAR into your local JAR packages

`mvn clean` delete everything

And if I'm being a bit snarky...

<https://gradle.org> A *better* Java build tool

(That doesn't work everywhere and is much worse than Maven when you try and do more complex things...)

Wrap up

- ▶ Language specific build tools exist
- ▶ You should probably use them
- ▶ (but I still use good ol' make a lot more)

Aside

Sometimes you'll find you pull a project and it uses a certain build system and you just know you're going to have to spend a day fighting it.
...please don't use CMake.