(R)evolution of Java packaging in GNU/Linux

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Abstract

Packaging Java in GNU/Linux distributions is complicated by incomplete tooling. Over past 2 years, tooling and guidelines for packaging Java have changed in Fedora considerably. What used to be a 1000 line build script can soon become 100 lines of mostly metadata. We present new bleeding edge distribution-neutral tooling for packaging Maven artifacts.

Why is there a problem in the first place?

- Sort of NIH syndrome everywhere
- Each Java package a unique set of problems
  - Ant, Maven, Gradle, Ivy, 20 XML parser dependencies
- Each Linux distribution a unique set of problems
  - RPM, APT, Portage, FHS, exceptions to FHS
- Can we do better?
  - Conventions
  - Tooling
  - Sharing
  - Caring

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First things first

Maven is the only widely-used Java build tool with any resemblance of conventions

RPM	Maven
Name	<artifactId/>
Version	<version/>
(Build)Requires	<dependencies/>
License	<licenses/>
%summary	<name/>
%description	<description/>
%prep	<build/>
%build	<build/>
%install	<build/>
...	...

Maven modifications in Fedora

- Custom resolver used in local mode
- Verification of models turned off in local mode
- Fix test scope dependency resolving when tests are disabled
- Approximate idea is:
  - Create a file that will map GAV to jars on filesystem
  - Maven loads this file when running in local mode
  - Return artifacts based on this mapping

Getting rid of cruft

We had this in our spec files

```
Requires(post): jpackage-utils
Requires(postun): jpackage-utils

%post
%update_maven_depmap

%postun
%update_maven_depmap
```

Now we have

Fixing manual mapping for GAVs

Mapping between GAV and jar was manual

```
%add_to_maven_depmap org.apache.commons commons-io 2.5 JPP commons-io
```

Better way with the same result

```
%add_maven_depmap JPP-commons-io.pom commons-io.jar
```

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Modifications of pom.xml

Old style patching

```
--- ./surefire-providers/pom.xml.sav
+++ ./surefire-providers/pom.xml
@@ -30,8 +30,10 @@
   <name>SureFire Providers</name>
   <modules>
     <module>surefire-junit</module>
+<!--
     <module>surefire-junit4</module>
     <module>surefire-testng</module>
+-->
   </modules>
   <dependencies>
     <dependency>
```

New macros

```
%pom_disable_module surefire-junit4
%pom_disable_module surefire-testng
```

File lists

Manual listing

```
%files
%defattr(-,root,root,-)
%doc LICENSE.txt NOTICE.txt RELEASE-NOTES.txt
%{_javadir}/*.jar
%{_mavenpomdir}/JPP-%{short_name}.pom
%{_mavendepmapfragdir}/*
```

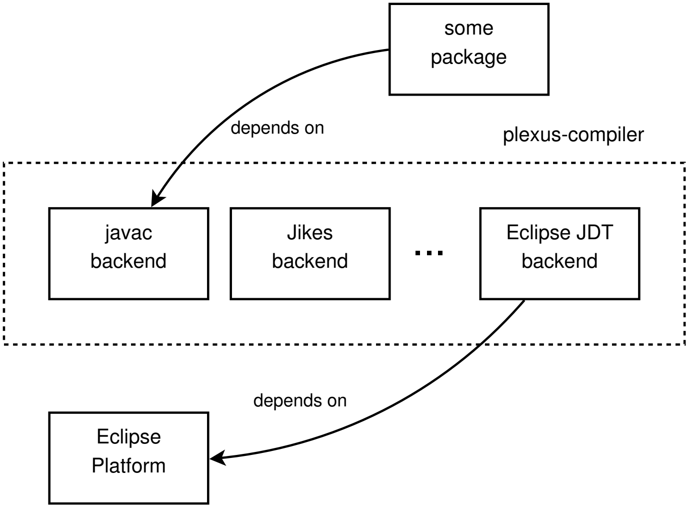
Automated way

```
%files -f .mfiles
%doc LICENSE.txt NOTICE.txt RELEASE-NOTES.txt
```

Current state

- Simple issues were solved
- Most time-consuming tasks are still manual
  - keeping dependencies up-to-date
  - installing multi-artifact packages
  - maintenance of multiple subpackages

Plexus-compiler example



A tool is needed

- Simple usage
- Powerfull
- Convention over configuration

Structure of XMvn

- Portable part
  - pure Java
  - integration with Maven
  - highly configurable
  - uses unmodified Maven
- Distribution-specific part
  - macros and shell scripts
  - integration with package manager
  - follows distribution standards
  - automatic dependency generation

Preparation for the build

Patching POM files

```
%pom_add_dep org.apache.commons:commons-io
%pom_disable_module submod-foo
```

Launching build

```
%mvn_file : %{name}
%mvn_build
```

During build

- Create build plan
- Read package metadata
- Call Maven to build the package
  - compile sources
  - run tests
  - generate javadocs
- Generate metadata

After the build

Installation

```
%mvn_install
```

Enumerating files

```
%files -f .mfiles
%files javadoc -f .mfiles-javadoc
```

Example spec file (part 1)

```
Name:           maven-shared-incremental
Version:        1.0
Release:        1%{?dist}
Summary:        Maven Incremental Build support utilities
License:        ASL 2.0
URL:            http://maven.apache.org/shared/maven-shared-incremental/
Source0:        http://repo1.maven.org/maven2/org/apache/maven/[...]
BuildArch:      noarch

BuildRequires:  maven-local
BuildRequires:  plexus-component-annotations
BuildRequires:  plexus-component-api

%description
Various utility classes and plexus components for supporting
incremental build functionality in maven plugins.

%package javadoc
Summary:        API documentation for %{name}

%description javadoc
This package provides %{summary}.
```

Example spec file (part 2)

```
%prep
%setup -q

%build
%mvn_build

%install
%mvn_install

%files -f .mfiles
%doc LICENSE NOTICE
%dir %{_javadir}/%{name}

%files javadoc -f .mfiles-javadoc
%doc LICENSE NOTICE

%changelog
* Wed Jan 23 2013 Mikolaj Izdebski <mizdebsk@redhat.com> - 1.0-1
- Initial packaging
```

Advantages

- Simpler, more readable packages
- Easier and faster packaging and updates
- Better quality packages
- Reduced metadata redundancy
- No modifications to Maven
- Changes in guidelines are easier to introduce

Easier Maven maintenance

Maven diff

```
0001-Add-plugin-api-deps.patch                     |  28 --
0001-Customize-compiler-plugin.patch               | 104 ------
0002-Use-custom-resolver.patch                     | 224 -------------
0003-Use-utf-8-source-encoding.patch               |  24 --
...-scope-skipping-with-maven.test.skip.patch | 160 ---------
...ompiler-plugin-default-to-source-1.5.patch |  33 --
JavadirWorkspaceReader.java                        | 198 -----------
MavenJPackageDepmap.java                           | 313 ------------------
maven-empty-dep.jar                                | Bin 341 -> 0 bytes
maven-empty-dep.pom                                |   9 -
maven-script-local                                 |  47 ---
maven-script-rpmbuild                              |  93 ------
maven.spec                                         | 269 +++------------
repo-metadata.tar.xz                               | Bin 3028 -> 0 bytes
14 files changed, 37 insertions(+), 1465 deletions(-)
```

Build description of maven-surefire in F-12

```
%if %{with_maven}
    export MAVEN_REPO_LOCAL=$(pwd)/.m2/repository
    mkdir -p $MAVEN_REPO_LOCAL
    cat %{SOURCE4}
    mvn-jpp -e -Dmaven.repo.local=$MAVEN_REPO_LOCAL \
        -Dmaven2.jpp.depmap.file=%{SOURCE4} \
        -Dmaven.test.skip=true install
    for dir in maven-surefire-plugin maven-surefire-report-plugin \
               surefire-api surefire-booter surefire-providers/surefire-junit;
        (cd $dir
         mvn-jpp -Dmaven.repo.local=$MAVEN_REPO_LOCAL \
                 -Dmaven2.jpp.depmap.file=%{SOURCE4} \
                 javadoc:javadoc
        )
    done
%else
    mkdir -p lib
    build-jar-repository -s -p lib classworlds junit plexus/utils
    ant -Dmaven.mode.offline=true
    cp -p target/*jar ../lib/$project.jar
%endif
```

Build description of maven-surefire in F-15

```
# tests turned off because they need jmock
mvn-rpmbuild -e \
        -Dmaven.local.depmap.file=%{SOURCE1} \
        -Dmaven.test.skip=true \
        install javadoc:aggregate
```

Build description of maven-surefire in F-19

```
%mvn_build -f
```

Simplified package

maven-surefire diff between F-12 and F-18

```
.cvsignore                             |   3 -
.gitignore                             |  14 +
Makefile                               |  21 --
maven-surefire-2.3-junit4-pom.patch    |  11 -
maven-surefire-booter-build.xml        |  64 -----
maven-surefire-build.xml               |  90 ------
maven-surefire-buildonlyjunit3.patch   |  13 -
maven-surefire-buildskiptestng.patch   |  12 -
maven-surefire-jpp-depmap.xml          |  23 --
maven-surefire-plexus12.patch          |  20 --
maven-surefire.spec                    | 399 +++++++-------------------
sources                                |   3 +-
12 files changed, 117 insertions(+), 556 deletions(-)
```

Disadvantages

- Harder to debug
- Incompatibility with older systems
- Bleeding edge

Summary

- Improved packaging
- Full solution
- Backwards-compatible
- Smooth transition

Future

- Automated package generation
- Debugging tools
- Graphical tooling
- Support for more types of artifacts
- Integration with Eclipse
- Adoption by different distributions?

Links

- Code repository
  - `http://git.fedorahosted.org/git/xmvn.git`
- Fedora 19 feature
  - `http://fedoraproject.org/wiki/Features/XMvn`
- Cookbook
  - `http://mizdebsk.fedorapeople.org/xmvn/cookbook/`

The end.

Thanks for listening.