Bundlor User Guide

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1.1.2.RELEASE

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1. Introduction to Bundlor

1.1 About Bundlor

With the increasing focus on OSGi in Enterprise Java, there has been increasing focus on creating OSGi bundles for deployment. When a development team is creating their own bundles, bundlor simplifies the creation and maintenance of the OSGi metadata of each bundle.

Bundlor also helps in the use of third-party enterprise libraries, many of which are not packaged as OSGi bundles. In this case, developers must add OSGi metadata to the library before use.

Bundlor helps in both these scenarios. It can be very hard for developers to keep track of the dependencies needed by a JAR file. Bundlor is a tool that automates the detection of dependencies and the creation of OSGi manifest directives for JARs after their creation. Bundlor takes as input a JAR and a template consisting of a superset of the standard OSGi manifest headers. Bundlor analyses the source code and support files contained in the JAR, applies the template to the results, and generates a manifest.

The use of Bundlor can take different forms, from an Apache ANT task and an Apache Maven plugin, to simple command line execution.

2. Getting Bundlor

2.1 Getting the Bundlor ZIP

Eclipse Virgo Bundlor is distributed as a ZIP file.

1. Download the ZIP file from the Virgo download page.

   The Virgo download page is located at http://www.eclipse.org/virgo/download/.

2.2 Getting Bundlor with Ivy

Eclipse Virgo Bundlor can be obtained from an Ivy repository.

1. Add the Virgo resolver to the `ivysettings.xml` file

```
<url name="eclipse.virgo.build.read.resolver">
  <ivy pattern="http://build.eclipse.org/rt/virgo/ivy/bundles/release/[organisation]/[module]/[revision]/[artif
  <artifact pattern="http://build.eclipse.org/rt/virgo/ivy/bundles/release/[organisation]/[module]/[revision]/[
</url>
```

2. Download the Eclipse Virgo Bundlor dependency in the `build.xml` file

```
<ivy:cachepath resolveId="bundlor.classpath" pathid="bundlor.classpath" organisation="org.eclipse.virgo.bundlor
    module="org.eclipse.virgo.bundlor.ant" revision="1.1.2.RELEASE" conf="ant" inline="true"
    type="jar" log="download-only"/>
```

2.3 Getting Bundlor with Maven

Eclipse Virgo Bundlor can be obtained from a Maven repository.

1. Add the Eclipse Virgo build and SpringSource Enterprise Bundle Repository resolvers to the `pom.xml` file

```
<repository>
  <id>eclipse.virgo.build.bundles.release</id>
  <name>Eclipse Virgo Build</name>
  <url>http://build.eclipse.org/rt/virgo/maven/bundles/release</url>
</repository>
<repository>
  <id>com.springsource.repository.bundles.external</id>
  <name>SpringSource Enterprise Bundle Repository - External Bundle Releases</name>
  <url>http://repository.springsource.com/maven/bundles/external</url>
</repository>
```

2. Add a dependency to the `pom.xml` file

```
<dependencies>
  <dependency>
    <groupId>org.eclipse.virgo.bundlor</groupId>
        <artifactId>org.eclipse.virgo.bundlor.maven</artifactId>
        <version>1.1.2.RELEASE</version>
        <scope>compile</scope>
  </dependency>
</dependencies>
```

3. Quickstart

3.1 Command Line Quickstart

The command line client allows Bundlor to be run from the command line.

1. Change directory to the `$BUNDLOR_HOME/bin` directory where `$BUNDLOR_HOME` is a directory into which the bundlor ZIP file distribution has been unzipped.

2. Run `bundlor.sh` or `bundlor.bat` scripts. See Section 4.1, “Command-Line Usage” for details.

```
% ./bundlor.sh \
-i ./org.springframework.integration.jar \
-m ./template.mf \
-o ./target/org.springframework.integration.jar

Transformed bundle written to ./target/org.springframework.integration.jar
%
```

3.2 Apache ANT Quickstart

The ANT task allows Bundlor to be run from inside any ANT based build system.

1. Define a `bundlor` namespace

```
<project name="bundlor-sample-ant"
    xmlns:bundlor="antlib:org.eclipse.virgo.bundlor.ant">
```

2. Import the `bundlor` task into your build

```
<target name="bundlor.init">
  <ivy:cachepath resolveId="bundlor.classpath" pathid="bundlor.classpath" organisation="org.eclipse.virgo.bundl
                 module="org.eclipse.virgo.bundlor.ant" revision="1.1.2.RELEASE" conf="ant" inline="true"
                 type="jar" log="download-only"/>
  <taskdef resource="org/eclipse/virgo/bundlor/ant/antlib.xml" uri="antlib:org.eclipse.virgo.bundlor.ant"
           classpathref="bundlor.classpath"/>
</target>
```

3. Use the `bundlor` task. See Section 4.2, “Apache ANT Usage” for details about the parameters of the task.

```

<bundlor:bundlor
    inputPath="${basedir}/target/classes"
    outputPath="${basedir}/target/classes"
    bundleVersion="1.0.2.BUILD-${timestamp}"
    manifestTemplatePath="${basedir}/template.mf"/>

```

3.3 Apache Maven Quickstart

The Maven plugin allows Bundlor to be run from inside any Maven project.

1. Add the Eclipse Virgo build and SpringSource Enterprise Bundle Repository to the `pom.xml` file

```
<pluginRepositories>
  <pluginRepository>
    <id>eclipse.virgo.build.bundles.release</id>
    <name>Eclipse Virgo Build</name>
    <url>http://build.eclipse.org/rt/virgo/maven/bundles/release</url>
  </pluginRepository>
  <pluginRepository>
    <id>com.springsource.repository.bundles.external</id>
    <name>SpringSource Enterprise Bundle Repository - External Bundle Releases</name>
    <url>http://repository.springsource.com/maven/bundles/external</url>
  </pluginRepository>
  ...
</pluginRepositories>
```

2. Use the `bundlor` plugin in the `pom.xml` file. See Section 4.3, “Apache Maven Usage” for details about the parameters of the plugin.

```
<build>
  <plugins>
    <plugin>
      <groupId>org.eclipse.virgo.bundlor</groupId>
      <artifactId>org.eclipse.virgo.bundlor.maven</artifactId>
      <version>1.1.2.RELEASE</version>
      <executions>
        <execution>
          <id>bundlor</id>
          <goals>
            <goal>bundlor</goal>
          </goals>
        </execution>
      </executions>
    </plugin>
    <plugin>
      <groupId>org.apache.maven.plugins</groupId>
      <artifactId>maven-jar-plugin</artifactId>
      <version>2.4</version>
      <configuration>
        <archive>
          <manifestFile>
            target/classes/META-INF/MANIFEST.MF
          </manifestFile>
        </archive>
      </configuration>
    </plugin>
    ...
  </plugins>
  ...
</build>
```

4. Usage

4.1 Command-Line Usage

The command line client allows Bundlor to be run from the command line of any platform

Command Syntax

To use Bundlor run the following for UNIX and Windows respectively.

```
$BUNDLOR_HOME/bin/bundlor.sh [options]
```

```
%BUNDLOR_HOME%\bin\bundlor.bat [options]
```

Command Line Reference

Command Line Parameters

The following table lists all the parameters that you can specify for the `bundlor` command line client.

Table 4.1. Attributes

Attribute	Description	Required
-f	Whether Bundlor should cause a build failure when there are warnings about the resulting manifest	No - defaults to `false`
-i <path>	The path to the input to create a manifest for. This can either be a directory or a JAR file.	Yes
-m <path>	The path to the manifest template. See Chapter 5, *Manifest Templates* for details.	No
-p <path>	The path to the OSGi profile. See Chapter 6, *OSGi Profiles and Bundlor* for details.	No
-o <path>	The path to write the manifest to. This can either be a directory, a	No - defaults to `System.out`

Attribute	Description	Required
	JAR file, or not specified. If a directory is specified, the manifest will be written to `${directory}/META-INF/MANIFEST.MF`. If a JAR file is specified, the manifest will be written as the manifest for that JAR file. If nothing is specified, the manifest will be written to `System.out`.	
-r <path>	The path to a properties file used for substitution. See Section 5.3, “Specifying property placeholders” for details.	No

Command Line Property Values

Property substitution values can be optionally specified on the command line instead of as an external file using the `-Dproperty=value` parameter.

```
% ./bundlor.sh \
-i ./org.springframework.integration.jar \
-m ./template.mf \
-o ./target/org.springframework.integration.jar \
-Dname="Spring Integration"

Transformed bundle written to ./target/org.springframework.integration.jar
%
```

See Section 5.3, “Specifying property placeholders” for details.

4.2 Apache ANT Usage

The ANT task allows you to run Bundlor from inside any ANT based build system

ANT Setup

The following procedure shows how to set up Bundlor inside of an existing ANT build file

1. Define a `bundlor` namespace

```
<project name="bundlor-sample-ant"
    xmlns:bundlor="antlib:org.eclipse.virgo.bundlor.ant">
```

2. Import the `bundlor` task into your build

```
<target name="bundlor.init">
  <ivy:cachepath resolveId="bundlor.classpath" pathid="bundlor.classpath" organisation="org.eclipse.virgo.bundl
                 module="org.eclipse.virgo.bundlor.ant" revision="1.1.2.RELEASE" conf="ant" inline="true"
                 type="jar" log="download-only"/>
  <taskdef resource="org/eclipse/virgo/bundlor/ant/antlib.xml" uri="antlib:org.eclipse.virgo.bundlor.ant"
           classpathref="bundlor.classpath"/>
</target>
```

   This example uses a very simplistic method for building the `bundlor` task classpath. It is possible to use a dependency manager such as Ivy to better manage the classpath of Bundlor.

3. Use the `bundlor` task, as shown in the following example. See the section called “ANT Task Reference” for details about the parameters of the task.

```
<bundlor:bundlor
    inputPath="${basedir}/target/classes"
    outputPath="${basedir}/target/classes"
    bundleVersion="1.0.2.BUILD-${timestamp}"
    manifestTemplatePath="${basedir}/template.mf" >
  <property name="name" value="${ant.project.name}" />
</bundlor:bundlor>
```

ANT Task Reference

Task Attributes

The following table lists all the attributes that you can specify for the `bundlor` ANT task.

Table 4.2. Attributes

Attribute	Description	Required
bundleSymbolicName	The OSGi `Bundle-SymbolicName` for the resulting manifest	No
bundleVersion	The OSGi `Bundle-Version` for the resulting manifest	No
enabled	Whether Bundlor should create a manifest	No - defaults to `true`
failOnWarnings	Whether Bundlor should cause a build failure when there are warnings about the resulting	No - defaults to `false`

Attribute	Description	Required
	manifest	
inputPath	The path to the input to create a manifest for. This can either be a directory or a JAR file.	Yes
manifestTemplatePath	The path to the manifest template. See Chapter 5, *Manifest Templates* for details.	No
OSGiProfilePath	The path to the OSGi profile. See Chapter 6, *OSGi Profiles and Bundlor* for details.	No
outputPath	The path to write the manifest to. This can either be a directory, a JAR file, or not specified. If a directory is specified, the manifest will be written to `${directory}/META-INF/MANIFEST.MF`. If a JAR file is specified, the manifest will be written as the manifest for that JAR file. If nothing is specified, the manifest will be written to `System.out`.	No - defaults to `System.out`
propertiesPath	The path to a properties file used for substitution. See Section 5.3, “Specifying property placeholders” for details.	No

Inline Manifest Template

Manifest templates can be optionally specified inline instead of as an external file using the `<manifestTemplate/>` element.

```
<bundlor:bundlor>
  <manifestTemplate>
Bundle-ManifestVersion: 2
Bundle-Name: Bundlor Core
Bundle-SymbolicName: org.eclipse.virgo.bundlor
Bundle-Version: 0
  </manifestTemplate>
```

```
</bundlor:bundlor>
```

See Chapter 5, *Manifest Templates* for details.

Inline OSGi Profile

OSGi profiles can be optionally specified inline instead of as an external file using the `<OSGiProfile/>` element.

```
<bundlor:bundlor>
  <OSGiProfile>
org.OSGi.framework.system.packages = \
 org.eclipse.virgo.osgi.extensions.equinox.hooks,\
 javax.accessibility,\
 javax.activation,\
 javax.activation;version="1.1.1",\
 javax.activity,\
 javax.annotation,\
...

org.OSGi.framework.bootdelegation = \
 org.eclipse.virgo.kernel.authentication,\
 com.sun.*,\
 javax.xml.*,\
...
  </OSGiProfile>
</bundlor:bundlor>
```

See Chapter 6, *OSGi Profiles and Bundlor* for details.

Inline Property Values

Property substitution values can be optionally specified inline instead of as an external file using the `<property/>` and `<propertySet/>` elements.

```
<bundlor:bundlor>
  <property name="bundle.name" value="Kernel test bundle"/>
  <property name="bundle.version" value="1.0.2.BUILD-${timestamp}"/>
  <propertyset>
    <propertyref builtin="all"/>
  </propertyset>
</bundlor:bundlor>
```

See Section 5.3, “Specifying property placeholders” for details.

ANT Task Examples

Creating a manifest

```
<bundlor:bundlor
   inputPath="${basedir}/target/classes"
   outputPath="${basedir}/target/classes"
   bundleVersion="1.0.2.BUILD-${timestamp}"
   manifestTemplatePath="${basedir}/template.mf"/>
```

Creating a manifest with placeholder replacement

```
<bundlor:bundlor
    inputPath="${basedir}/target/classes"
    outputPath="${basedir}/target/target/classes"
    bundleVersion="1.0.2.BUILD-${timestamp}"
    manifestTemplatePath="${basedir}/template.mf">
  <property name="bundle.name" value="Kernel test bundle"/>
  <property name="bundle.version" value="1.0.2.BUILD-${timestamp}"/>
</bundlor:bundlor>
```

4.3 Apache Maven Usage

The Maven plugin allows Bundlor to be run from inside any Maven project.

Maven Setup

The following procedure shows how to set up Bundlor inside of an existing Maven `POM` file.

1. Add the Eclipse Virgo build and SpringSource Enterprise Bundle Repository to the `pom.xml` file.

```
<pluginRepositories>
  <pluginRepository>
    <id>eclipse.virgo.build.bundles.release</id>
    <name>Eclipse Virgo Build</name>
    <url>http://build.eclipse.org/rt/virgo/maven/bundles/release</url>
  </pluginRepository>
  <pluginRepository>
    <id>com.springsource.repository.bundles.external</id>
    <name>SpringSource Enterprise Bundle Repository - External Bundle Releases</name>
    <url>http://repository.springsource.com/maven/bundles/external</url>
  </pluginRepository>
  ...
</pluginRepositories>
```

2. Use the `bundlor` plugin, as shown in the following example. See the section called “Maven Plugin Reference” for details about the parameters of the plugin.

```
<build>
  <plugins>
    <plugin>
      <groupId>org.eclipse.virgo.bundlor</groupId>
      <artifactId>org.eclipse.virgo.bundlor.maven</artifactId>
      <version>1.1.2.RELEASE</version>
      <executions>
        <execution>
          <id>bundlor</id>
          <goals>
            <goal>bundlor</goal>
          </goals>
        </execution>
      </executions>
    </plugin>
    <plugin>
      <groupId>org.apache.maven.plugins</groupId>
      <artifactId>maven-jar-plugin</artifactId>
```

```
      <version>2.4</version>
      <configuration>
        <archive>
          <manifestFile>
            target/classes/META-INF/MANIFEST.MF
          </manifestFile>
        </archive>
      </configuration>
    </plugin>
    ...
  </plugins>
  ...
</build>
```

Maven Plugin Reference

Plugin Configuration

The following table lists all the elements that you can specify for the `bundlor` Maven plugin.

Table 4.3. Elements

Attribute	Description	Required
bundleSymbolicName	The OSGi `Bundle-SymbolicName` for the resulting manifest	No - defaults to `${project.artifactId}`
bundleVersion	The OSGi `Bundle-Version` for the resulting manifest	No - defaults to `${project.version}`
enabled	Whether Bundlor should create a manifest	No - defaults to `true`
failOnWarnings	Whether Bundlor should cause a build failure when there are warnings about the resulting manifest	No - defaults to `false`
inputPath	The path to the input to create a manifest for. This can either be a directory or a JAR file.	No - defaults to `${project.build.outputDirectory}`
manifestTemplate	An inline manifest template. See the section called “Inline Manifest Template” for details.	No
manifestTemplatePath	The path to the manifest template. See Chapter 5, *Manifest Templates* for details.	No - defaults to `${basedir}/template.mf`

Attribute	Description	Required
OSGiProfilePath	The path to the OSGi profile. See Chapter 6, *OSGi Profiles and Bundlor* for details.	No
outputPath	The path to write the manifest to. This can either be a directory, a JAR file, or not specified. If a directory is specified, the manifest will be written to `${directory}/META-INF/MANIFEST.MF`. If a JAR file is specified, the manifest will be written as the manifest for that JAR file.	No - defaults to `${project.build.outputDirectory}`
propertiesPath	The path to a properties file used for substitution. See Section 5.3, "Specifying property placeholders" for details.	No

Inline Manifest Template

Manifest templates can be optionally specified inline instead of as an external file using the `<manifestTemplate/>` element. For example:

```
<execution>
  <id>bundlor</id>
  <goals>
    <goal>bundlor</goal>
  </goals>
  <configuration>
    <manifestTemplate>
Bundle-ManifestVersion: 2
Bundle-Name: Bundlor Core
Bundle-SymbolicName: org.eclipse.virgo.bundlor
Bundle-Version: 0
    </manifestTemplate>
  </configuration>
</execution>
```

See Chapter 5, *Manifest Templates* for details.

If a `<manifestTemplate/>` element is specified, any `<manifestTemplatePath/>` element is ignored.

Inline OSGi Profile

OSGi profiles can be optionally specified inline instead of as an external file using the `<OSGiProfile/>` element.

```
<execution>
  <id>bundlor</id>
  <goals>
    <goal>bundlor</goal>
  </goals>
  <configuration>
    <OSGiProfile>
org.OSGi.framework.system.packages = \
 org.eclipse.virgo.osgi.extensions.equinox.hooks,\
 javax.accessibility,\
 javax.activation,\
 javax.activation;version="1.1.1",\
 javax.activity,\
 javax.annotation,\
...

org.OSGi.framework.bootdelegation = \
 org.eclipse.virgo.kernel.authentication,\
 com.sun.*,\
 javax.xml.*,\
...
    </OSGiProfile>
  </configuration>
</execution>
```

See Chapter 6, *OSGi Profiles and Bundlor* for details.

Inline Property Values

Property substitution values can be optionally specified inline instead of as an external file using the `<properties/>` element.

```
<project>
  ...
  <properties>
    <bundle.name>${project.name}</bundle.name>
    <bundle.version>2.0.0.RELEASE</bundle.version>
  </properties>
  ...
</project>
```

See Section 5.3, “Specifying property placeholders” for details.

Maven Plugin Examples

Creating a manifest

```
<project>
...
  <build>
    <plugins>
      <plugin>
        <groupId>org.eclipse.virgo.bundlor</groupId>
        <artifactId>org.eclipse.virgo.bundlor.maven</artifactId>
```

```
        <executions>
          <execution>
            <id>bundlor</id>
            <goals>
              <goal>bundlor</goal>
            </goals>
          </execution>
        </executions>
      </plugin>
    </plugins>
  </build>
...
</project>
```

Creating a manifest with placeholder replacement

```
<project>
...
  <properties>
    <bundle.name>${project.name}</bundle.name>
    <bundle.version>2.0.0.RELEASE</bundle.version>
  </properties>
...
  <build>
    <plugins>
      <plugin>
        <groupId>org.eclipse.virgo.bundlor</groupId>
        <artifactId>org.eclipse.virgo.bundlor.maven</artifactId>
        <executions>
          <execution>
            <id>bundlor</id>
            <goals>
              <goal>bundlor</goal>
            </goals>
          </execution>
        </executions>
      </plugin>
    </plugins>
  </build>
...
</project>
```

5. Manifest Templates

5.1 Introduction

A manifest template is a file that Bundlor uses during the generation of OSGi-compliant manifest entries in a JAR's manifest. The format of the manifest template is the same as that of a standard Java manifest file, i.e. a series of '`key: value`' pairs.

From this template, Bundlor recognizes a specific set of directives and uses them to generate the OSGi-compliant manifest entries. Bundlor will also add any other headers that are specified in the template to the generated manifest. This is typically used to specify things like the bundle's symbolic name and version.

You can also specify property placeholders, or variables, in your manifest template that Bundlor substitutes with actual values at runtime. With this feature, your manifest templates become more dynamic and useful across a variety of your projects. A particularly handy use for this feature is to tell Bundlor to automatically expand versions of imports based on a pattern of your choosing. See Section 5.3, “Specifying property placeholders” for details.

5.2 Manifest Template Format

The following table lists the headers you can add to the manifest template, in addition to the standard manifest headers.

Table 5.1. Headers for Manifest Template

Header	**Description**
`Excluded-Exports`	A comma-separated list of packages that must not be added to the manifest's `Export-Package` header. This is useful for preventing implementation packages from being exported.
`Excluded-Imports`	By default, Bundlor adds imports for every package that Bundlor determines is referenced by the code or for special files in the jar. Use this header to specify a comma-separated list of packages for which imports Bundlor will *not* generate.
`Export-Template`	By default, Bundlor versions all exported packages at the specified `Bundle-Version`. Use this header to specify that individual exported packages be exported at different versions. For

Header	Description
	example, `Export-Template com.foo.*;version="1.5"` results in Bundlor versioning any `Export-Package` entries for `com.foo` or its subpackages at `1.5`.
`Ignored-Existing-Headers`	If the JAR for which you are generating a manifest already contains an OSGi-compliant manifest, use this template header to list headers in the original manifest which Bundlor should ignore.
`Import-Template`	Use this header to augment package imports that Bundlor generates via bytecode and special file analysis. Typically you use the header to version the import and, in some cases, to mark them as optional. When you use this header to version the import, you can optionally specify a version expansion pattern so that Bundlor sets the version to a range rather than a single version. To use the header, set its value to a comma-separated list of package names and attributes.
`Version-Patterns`	Use this header to declare one or more version expansion patterns and give each one a name. You can then use these named patterns in the `Import-Template` header if you want to specify an expansion pattern for the `version` of an imported package. This feature is described in detail later in this section.

A wilcard '`*`' at the end of the package name is supported to match multiple packages. For example, the header `Import-Template: com.foo;version=[1.0,2.0);resolution:=optional,com.bar.*;version="[1.5,1.6)"` will cause any import generated for the `com.foo` package to be versioned at 1.0 (inclusive) to 2.0 (exclusive) and to be considered optional, and for any import of `com.bar` or its sub-packages to be versioned at 1.5 (inclusive) to 1.6 (exclusive).

5.3 Specifying property placeholders

To specify a property placeholder in your manifest template, use the form `${property.name}`, where `property.name` refers to the name of the property placeholder. The method in which the manifest template actually gets the value of the property placeholder at runtime depends on the Bundlor front end you use (command line, ANT, or Maven); the details are described later.

The following example shows how to use a property placeholder for the `Bundle-Name` manifest header rather than a literal.

```
Bundle-Name: ${bundle.name}
```

5.4 Specifying automatic version expansion of imported packages based on a pattern

When you use the `Import-Template` template header to augment package imports that Bundlor generates in the manifest file, you use the `version` attribute to specify a version range of the imported package.

```
Import-Template:
 org.eclipse.virgo.kernel.*;version="[1.2.0, 2.0.0)"
 org.apache.commons.logging;version="[1.1.1, 2.0.0)"
```

The preceding example specifies that Bundlor should import the `org.eclipse.virgo.kernel.*` packages in the range `[1.2.0, 2.0.0)` and the `org.apache.commons.logging` package in the range `[1.1.1, 2.0.0)` in the generated manifest file. This works just fine for many use cases, but sometimes the use of literal versions in this manner can be restrictive.

In order to make the manifest template more dynamic and useful, you can specify that Bundlor automatically expand the package version into a version range using an expansion pattern of your choosing. The pattern uses as a base a property placeholder that you define (as described in Section 5.3, “Specifying property placeholders”) and set to a valid OSGi version number. Then, based on the expansion pattern you specify, Bundlor generates a version range using the 4 parts of an OSGi version: major, minor, micro, and qualifier.

The way to tell Bundlor to automatically expand a package import version is to specify the property placeholder to the right of the `version` directive of the package in the `Import-Template` header, and then within the property placeholder, specify the pattern for both sides of the version range. The following manifest template snippet shows how to use this feature; the example is described in detail after the table.

```
Import-Template:
 org.eclipse.virgo.kernel.*;version="${org.eclipse.virgo.kernel:[=.=.=.=, +1.0.0)}",
 org.apache.commons.logging.*;version="${org.apache.commons.logging:[=.=.=.=, =.=.+1)}"
```

The following table lists the symbols you can use in the expansion pattern.

Table 5.2. Expansion Pattern Symbols

Symbol	Description	Location Allowed
=	Use the same value from the variable.	Valid only in the first three segments (major, minor, micro)

Symbol	Description	Location Allowed
		of the version pattern.
[+/-]n	Adjust the value from the variable by this amount. For example, `+1` means to add 1 to the value from the variable.	Valid only in the first three segments (major, minor, micro) of the version pattern.
n	Substitute this value for the one in the variable. Typically you only use this for putting in a `0`.	Valid only in the first three segments (major, minor, micro) of the version pattern.
Any legal qualifier value	Substitute this value for the one in the variable.	Valid only in the fourth (qualifier) segment of the version pattern.

Based on the descriptions of the symbols, we can now understand how the examples above work. First assume that you have set the property `${org.eclipse.virgo.kernel}` to the value `1.2.0`. Based on the expansion pattern, Bundlor sets the version range of the imported `org.eclipse.virgo.kernel.*` packages to `[1.2.0, 2.0.0)`. The pattern in this case first specifies that the beginning of the version range stay exactly the same as the value of the property. The pattern then specifies that at the end of the version range, the major part of the version should be one integer larger than what the property is originally set to (`1`); the pattern then specifies that the minor and micro segments of the version both be set to `0`.

Similarly, assume that you set the `${org.apache.commons.logging}` property to `1.4.0`. Bundlor generates a version range of `[1.4.0, 1.4.1)`. Again, the beginning of the range is exactly the same as the property value. The pattern specifies that, in the end of the range, only the micro segment of the version increase by one; the major and minor segments stay the same.

Re-using version patterns

If you use the same version expansion pattern for several imports, you can name the pattern using the `Version-Patterns` header in the manifest template, and then use this name in the particular import of `Import-Template`.

Use the form *`pattern.name`*`;pattern="`*`pattern`*`"` to specify a named pattern, where `pattern.name` is the name of the pattern and `pattern` is the pattern, such as `[=.=.=.=, +1.0.0)`.

```
Version-Patterns:
 apache;pattern="[=.=.=.=, +1.0.0)",
 hibernate;pattern="[=.=.=.=, =.=.+1)"
```

The preceding example shows two named patterns: `apache` and `hibernate`. The `apache` pattern specifies a version range from the one provided in the property up to but not including the next major

version. The `hibernate` pattern specifies a version range of the one provided up to but not including the next micro version.

To use a named pattern, simply substitute it in the `Import-Template` header in the place where you would put the in-line pattern.

```
Import-Template:
 org.apache.commons.codec.*;version="${org.apache.commons.codec:apache}",
 org.apache.commons.logging.*;version="${org.apache.commons.logging:apache}",
 org.hibernate.*;version="${org.hibernate:hibernate}"
 org.myorg.*;version="${org.myorg:[]=.=.=.=, =.+1.0.=)}"
```

In the example, the `apache` named pattern is used twice, for the two `org.apache` imports, and the `hibernate` pattern is used once. Also note that you can also include an import whose version is specified with an in-line pattern.

5.5 Example Bundlor Manifest Template

The following shows a simple example of a Bundlor manifest template file, with a description after the sample.

```
Bundle-ManifestVersion: 2
Bundle-SymbolicName: org.springframework.binding
Bundle-Name: ${bundle.name}
Import-Package:
 ognl;version="[2.6.9, 3.0.0)";resolution:=optional,
 org.jboss.el;version="[2.0.0, 3.0.0)";resolution:=optional
Import-Template:
 org.springframework.*;version="[2.5.4.A, 3.0.0)",
 org.apache.commons.logging;version="[1.1.1, 2.0.0)",
 javax.el;version="[2.1.0, 3.0.0)";resolution:=optional,
 ognl;version="[2.6.9, 3.0.0)";resolution:=optional,
 org.jboss.el;version="[2.0.0, 3.0.0)";resolution:=optional
```

The headers marked in bold are required in all manifest templates unless the jar already contains a manifest with those headers.

- `Bundle-ManifestVersion`: This should always be 2
- `Bundle-SymbolicName`: specifies a unique name for the bundle of `org.springframework.binding`
- `Bundle-Name`: specifies a human-readable name for the bundle. The example shows how to use a property placeholder `${bundle.name}`, which at runtime Bundlor will substitute with an actual value, such as `Spring Binding`.
- `Import-Package`: hard-codes two packages that will be imported (`ognl` and `org.jboss.el` in the generated manifest. Bundlor isn't infallible; this lets you add imports that it misses.
- `Import-Template`: specifies the versions for the package imports that Bundlor generates, marking

`javax.el`, `ognl`, and `org.jboss.el` optional.

6. OSGi Profiles and Bundlor

When managing and transforming bundles it can become difficult to remember which packages are boot delegated, which are exported from the system bundle, and which are from other bundles in your system. This information is important because you typically do not want to import packages into your own application that are boot delegated, you want to import system bundle packages at version `0`, and you want to define custom imports for all the rest of the bundles. Trying to keep track of which packages are in each of these categories can be error prone; similarly, defining template entries for them in your manifest template can be time-consuming and tedious.

To solve this problem, you can specify that Bundlor take an OSGi profile as input and automatically add template entries for boot delegated packages and system bundles. These import entries would ignore boot-delegated packages and set the version of system bundles to `version="0"`. This feature is available for all Bundlor front ends: command-line, ANT and Maven.

6.1 Overview of OSGi profiles

An OSGi profile defines the packages that a particular OSGi runtime (such as Virgo) exports from the system bundle and the packages that it delegates to the boot class loader. An OSGi profile isn't an actual file; rather, it is two properties that are well known to an OSGi runtime. However, when you pass these properties to Bundlor, you pass them as a file, as described in the next section. The properties that make up an OSGi profile are as follows.

- The `org.OSGi.framework.system.packages` property defines the packages exported from the system bundle.
- The `org.OSGi.framework.bootdelegation` property defines the packages that are boot delegated.

If you are using Virgo as your OSGi runtime, see the file `$VIRGO_HOME/configuration/java6-server.profile` for its OSGi profile, where `$VIRGO_HOME` refers to the main installation directory of Virgo. If you are using another OSGi runtime, such as Equinox, then see their documentation for their OSGi profile.

For additional information about the syntax of the values of these properties, see the OSGi Core specification.

6.2 Using OSGi profiles with Bundlor

The first step in using OSGi profiles with Bundlor is to create a file that contains a textual representation of the two properties that make up an OSGi profile: `org.OSGi.framework.system.packages` and `org.OSGi.framework.bootdelegation`. What you include in this file is up to you, but

typically you start with the OSGi profile of the OSGi runtime you are using, and then customize it to fit your environment.

If you are using Virgo as your OSGi runtime, you can start by copying the section of the file `$VIRGO_HOME/configuration/java6-server.profile` that refers to the two properties and pasting it into your text file. If you are using another runtime, consult their documentation.

The following snippet shows a partial OSGi profile for Virgo; for clarity only a few packages are shown. The example shows the format in which you should create your own OSGi profile file.

```
org.OSGi.framework.system.packages = \
 org.eclipse.virgo.osgi.extensions.equinox.hooks,\
 javax.accessibility,\
 javax.activation,\
 javax.activation;version="1.1.1",\
 javax.activity,\
 javax.annotation,\
...

org.OSGi.framework.bootdelegation = \
 org.eclipse.virgo.kernel.authentication,\
 com.sun.*,\
 javax.xml.*,\
...
```

Once you've created your OSGi profile file, the method of passing it to Bundlor depends on the front end you are using to generate a manifest. For detailed information about using the various front ends, see Chapter 4, *Usage*.

7. Detecting Manifest Requirements

Bundlor's main function is to scan an existing JAR file and determine its runtime dependencies. With this information it can then generate the OSGi-compliant manifest headers needed for proper runtime operation. This analysis is comprised of looking for class references and class names in Java classes and certain well-known file types.

7.1 Java Detection Criteria

Bundlor scans any Java class it can find in the artifact created by the underlying build system. This means that if a build process has custom behavior (i.e. weaving with AspectJ or `jarjar`ing), Bundlor will be able to see and analyze the changes made by that process as long as the changes are in the artifact created by the build system.

There are a number of places in a Java class that another Java type can be referenced from. Bundlor detects these references and adds manifest requirements for them.

Export Package

Bundlor exports any package that contains a class.

Import Package

The following is a list of the places that Bundlor will search for type names

- Declared Type Superclass Types
- Declared Type Implemented Interfaces Types
- Declared Type Annotation Types
- Declared Field Types
- Declared Field Values Types
- Declared Method Argument Types
- Declared Method Return Types
- Declared Method Exception Types
- Declared Method Annotation Types
- Reference To Field Owner Type

- Reference To Field Type
- Declared Local Variable Type
- Reference to Method Declaring Type
- Reference to Method Return Type
- Reference to Method Argument Types
- Allocation of Array Type
- Declared Parameter Annotation Types
- Caught Exception Type
- Instantiated Type
- Cast Target Type
- Instanceof Type
- Declared Constant Type

7.2 Spring Context Configuration Detection Criteria

Bundlor scans for Spring context configuration files. If it detects this file type, it scans the file for a number of values that contain class names.

Spring Context Values

Using XPath syntax, the following is a list of values searched for type names

- `//beans:bean/@class`
- `//aop:declare-parents/@implement-interface`
- `//aop:declare-parents/@default-impl`
- `//context:load-time-weaver/@weaver-class`
- `//context:component-scan/@name-generator`
- `//context:component-scan/@scope-resolver`
- `//jee:jndi-lookup/@expected-type`

- `//jee:jndi-lookup/@proxy-interface`
- `//jee:remote-slsb/@home-interface`
- `//jee:remote-slsb/@business-interface`
- `//jee:local-slsb/@business-interface`
- `//jms:listener-container/@container-class`
- `//lang:jruby/@script-interfaces`
- `//lang:bsh/@script-interfaces`
- `//oxm:class-to-be-bound/@name`
- `//oxm:jibx-marshaller/@target-class`
- `//osgi:reference/@interface`
- `//osgi:service/@interface`
- `//util:list/@list-class`
- `//util:map/@map-class`
- `//util:set/@set-class`
- `//webflow:flow-builder/@class`
- `//webflow:attribute/@type`
- `//osgi:service/osgi:interfaces/beans:value`
- `//osgi:reference/osgi:interfaces/beans:value`
- `//context:component-scan/@base-package`

7.3 Blueprint Service Configuration Detection Criteria

Bundlor scans for Blueprint Service configuration files. If it detects this file type, it scans the file for a number of values that contain class names.

Blueprint Configuration Values

Using XPath syntax, the following is a list of values searched for type names

- `//bp:bean/bp:argument/@type`
- `//bp:bean/@class`
- `//bp:service/@interface`
- `//bp:reference/@interface`
- `//bp:reference-list/@interface`
- `//bp:map/@key-type`
- `//bp:map/@value-type`
- `//bp:list/@value-type`
- `//bp:set/@value-type`
- `//bp:array/@value-type`
- `//bp:interfaces/bp:value`

7.4 Web Application File Detection Criteria

Bundlor scans for the Servlet `web.xml` file located in the `WEB-INF` directory. If it detects this file, it scans the file for a number of values that contain class names.

`web.xml` Values

Using XPath syntax, the following is a list of values searched for type names

- `//context-param/param-values`
- `//filter/filter-classs`
- `//filter/init-param/param-values`
- `//listener/listener-classs`
- `//servlet/servlet-classs`
- `//servlet/init-param/param-values`
- `//error-page/exception-types`
- `//env-entry/env-entry-types`

- `//ejb-ref/homes`
- `//ejb-ref/remotes`
- `//ejb-local-ref/local-homes`
- `//ejb-local-ref/locals`
- `//service-ref/service-interfaces`
- `//resource-ref/res-types`
- `//resource-env-ref/resource-env-ref-types`
- `//message-destination-ref/message-destination-type`

7.5 `Bundle-Classpath` File Detection Criteria

Bundlor scans for JAR files located anywhere in the bundle. If it detects this file, it runs the entire set of analyzers against it. The imports and exports of the JAR file are added to the bundle's manifest and the JAR file is placed on the bundle's `Bundle-Classpath`.

7.6 JPA Detection Criteria

Bundlor scans for the JPA `persistence.xml` and `orm.xml` files located in the `META-INF` directory. If it detects this file it scans the file for a number of values that contain class names and package names. If the class name is unqualified (i.e. has no '`.`' in it), the classname is prepended with the content of the `entity-mapping` tag's `package` element.

`persistence.xml` Values

Using XPath syntax, the following is a list of values searched for type names

- `//persistence-unit/provider`
- `//persistence-unit/class`

`orm.xml` Values

Using XPath syntax, the following is a list of values searched for type names

- `//element-collection/@target-class`

- `//embeddable/@class`
- `//entity/@class`
- `//entity-listener/@class`
- `//entity-result/@entity-class`
- `//id-class/@class`
- `//many-to-many/@target-entity`
- `//many-to-one/@target-entity`
- `//map-key-class/@class`
- `//mapped-superclass/@class`
- `//named-native-query/@result-class`
- `//one-to-many/@target-entity`
- `//one-to-one/@target-entity`

7.7 EclipseLink Detection Criteria

Bundlor scans for the EclipseLink `eclipselink-orm.xml` files located in the `META-INF` directory. If it detects this file it scans the file for a number of values that contain class names and package names. If the class name is unqualified (i.e. has no '`.`' in it), the classname is prepended with the content of the `entity-mapping` tag's `package` element.

`eclipselink-orm.xml` Values

Using XPath syntax, the following is a list of values searched for type names

- `//cache-interceptor/@class`
- `//converter/@class`
- `//copy-policy/@class`
- `//customizer/@class`
- `//discriminator-class/@value`
- `//id-class/@class`

- `//element-collection/@target-class`
- `//entity/@class`
- `//entity-listener/@class`
- `//entity-result/@entity-class`
- `//embeddable/@class`
- `//many-to-many/@target-entity`
- `//many-to-one/@target-entity`
- `//map-key-class/@class`
- `//mapped-superclass/@class`
- `//named-native-query/@result-class`
- `//named-stored-procedure-query/@result-class`
- `//object-type-converter/@data-type`
- `//object-type-converter/@object-type`
- `//one-to-many/@target-entity`
- `//one-to-one/@target-entity`
- `//property/@value-type`
- `//query-redirectors/@all-queries`
- `//query-redirectors/@read-all`
- `//query-redirectors/@read-object`
- `//query-redirectors/@report`
- `//query-redirectors/@update`
- `//query-redirectors/@insert`
- `//query-redirectors/@delete`
- `//read-transformer/@transformer-class`
- `//stored-procedure-parameter/@type`

- `//struct-converter/@converter`
- `//type-converter/@data-type`
- `//type-converter/@object-type`
- `//variable-one-to-one/@target-interface`
- `//write-transformer/@transformer-class`

7.8 Hibernate Mapping File Detection Criteria

Bundlor scans for any file that ends with a `.hbm` extension. If it detects one of these files it scans the file for a number of attributes that can contain class names. If the class name is unqualified (i.e. has no '`.`' in it), the classname is prepended with the content of the `hibernate-mapping` tag's `package` attribute. Many of the attributes that can contain class names can also contain Hibernate keywords corresponding to Hibernate-known types. When these are detected, no manifest requirements are added.

Hibernate Attributes

Using XPath syntax, the following is a list of attributes searched for type names

- `//class/@name`
- `//id/@type`
- `//generator/@class`
- `//composite-id/@class`
- `//discriminator/@type`
- `//property/@type`
- `//many-to-one/@class`
- `//one-to-one/@class`
- `//one-to-many/@class`
- `//many-to-many/@class`
- `//version/@type`
- `//component/@class`

- `//dynamic-component/@class`
- `//subclass/@name`
- `//joined-subclass/@name`
- `//union-subclass/@name`
- `//import/@class`

Hibernate Keywords

The following is a list of reserved Hibernate keywords that will not trigger the addition of manifest requirements

- `assigned`
- `big_decimal`
- `big_integer`
- `binary`
- `blob`
- `boolean`
- `byte`
- `calendar`
- `calendar_date`
- `character`
- `class`
- `clob`
- `currency`
- `date`
- `double`
- `float`
- `foreign`

- guid
- hilo
- identity
- imm_binary
- imm_calendar
- imm_calendar_date
- imm_date
- imm_serializable
- imm_time
- imm_timestamp
- increment
- integer
- locale
- long
- native
- select
- seqhilo
- sequence
- sequence-identity
- serializable
- short
- string
- text
- time
- timestamp

- `timezone`
- `true_false`
- `uuid`
- `yes_no`

7.9 JSP File Detection Criteria

Bundlor scans for the JSP files. If it detects this file, it scans the file for a number of values that contain class names.

JSP Values

Using Regular expression syntax, the following is a list of values searched for type names

- `<%@ page.*import=\"(.*?)\".*%>`

7.10 Log4J Configuration Detection Criteria

Bundlor scans for Log4J configuration files. If it detects this file type, it scans the file for a number of values that contain class names.

Log4J Configuration Values

Using XPath syntax, the following is a list of values searched for type names

- `//appender/@class`
- `//layout/@class`

7.11 Static Resource Detection Criteria

Bundlor scans for any static resource and exports that package.

8. Detecting Manifest Issues

Bundlor's second function is to scan an existing manifest and identify any potential issues with it.

8.1 Import Version Range Warning Criteria

Bundlor checks that all entries in the `Import-Package` header have a sensible version range declared. This ensures that there are no version ranges that are reversed (`[2, 1)`), and no version ranges that are empty (`[1, 1)`).

8.2 Import of Exported Packages Warning Criteria

Bundlor checks that the manifest does not import any package that it exports. This behavior is usually indicative of a package split between two bundles.

8.3 Signed JAR Warning Criteria

Bundlor checks that the manifest does not contain headers indicating that it is from a signed JAR. Running Bundlor against a signed JAR will render that JAR invalid as the manifest will have changed from when it was signed.

8.4 Versioned Imports Warning Criteria

Bundlor checks that all entries in the `Import-Package` header have a version range declared.

8.5 Versioned Exports Warning Criteria

Bundlor checks that all entries in the `Export-Package` header have a version declared.

8.6 `Bundle-SymbolicName` Warning Criteria

Bundlor checks that the manifest contains a `Bundle-SymbolicName` header.

8.7 `Manifest-Version` Warning Criteria

Bundlor checks that the manifest contains a `Bundle-ManifestVersion` header with a value of `2`.