

# Distributing your Application as an executable JAR file

A JAR (Java ARchive) is a way of packaging together all of the resources associated with a program (class files, images, sounds, etc.). Putting your program in a JAR allows it to be distributed as a single executable file, saving space and simplifying the download process. The information in this tutorial applies to Java version 1.2 or higher. For more information about JAR files, follow [Sun's tutorial](#). To learn about [signing the JAR](#) and [Java Web Start](#).

**A simple example.** Let's say we wanted to distribute the simple program [Hello.java](#) as a JAR. First, we create a text file named `Hello.mf` which contains:

```
Manifest-Version: 1.0
Main-Class: Hello
```

Then, we create the archive by typing:

```
jar cmf Hello.mf Hello.jar Hello.class Hello.java
```

and run it by typing:

```
java -jar Hello.jar
```

The file [Hello.jar](#) can now be downloaded and executed.

**Creating an executable JAR file.** Here is the general procedure for creating an executable JAR:

1. Compile your java code, generating all of the program's class files.
2. Create a *manifest file* containing the following 2 lines:

```
Manifest-Version: 1.0
Main-Class: name of class containing main
```

The name of the file should end with the `.mf` suffix. It is important that the file ends with a blank line.

3. To create the JAR, type the following command:

```
jar cmf manifest-file jar-file input-files
```

The *input-files* must include any class files, images, sounds, etc. that your program uses. Optionally, you can include the program's `.java` files in the JAR. See below for adding directories of the JAR.

4. To view the contents of the JAR, type:

```
jar tf jar-file
```

5. Execute the application from the command line by typing:

```
java -jar jar-file
```

If the application is GUI-based, you can also launch it by double-clicking the JAR file.

**Accessing resources in a JAR.** In general, the first step in accessing a JAR resource involves creating a URL. This might require modifying your program. For example, you can no longer use the following code fragment to read in an image that is stored in a file as follows

```
Image image = Toolkit.getDefaultToolkit().getImage(filename);
```

Instead, create the URL object using

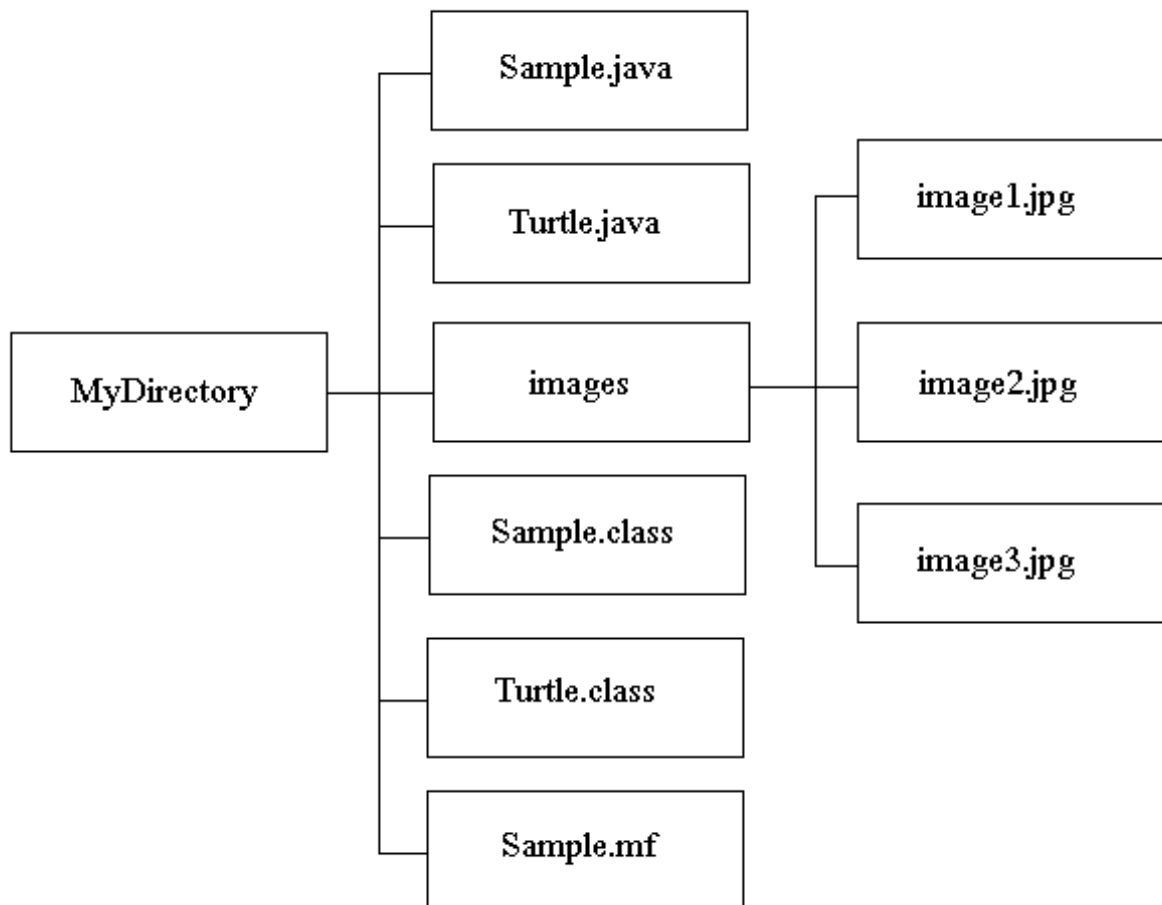
```
URL url = getClass().getResource(filename);  
Image image = Toolkit.getDefaultToolkit().getImage(url);
```

Or, if the code is in a static method of class X, then create the URL with

```
URL url = X.class.getResource(filename);
```

Now, the resource can be accessed the same way, regardless of whether it is in a JAR or the current directory. See the method `play(filename)` in [StdDraw.java](#) for an example involving audio clips, and the constructor `In(String s)` in [In.java](#) for an example involving text files.

**JAR Subdirectories.** The JAR format also support storing files in a directory structure. Consider a program `Sample.java`, which uses the Turtle Graphics interface to display a collection of pictures stored in a subdirectory called `images`. Our [working directory](#) looks like:



The Manifest should read:

```
Manifest-Version: 1.0  
Main-Class: Sample
```

To create the JAR, type:

```
jar cmf Sample.mf Sample.jar Sample.class Turtle.class Sample.java Turtle.java images
```

The contents listing appears as:

```
META-INF/  
META-INF/MANIFEST.MF  
Sample.class  
Turtle.class  
Sample.java  
Turtle.java  
images/  
images/image1.gif  
images/image2.gif  
images/image3.gif
```

Notice that the directory structure is still preserved (the META-INF directory is created to hold the manifest and other general information about the JAR).

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