

JAgent

JAgent framework helps you to implement java agents. It has some extra functionality instead of standard Java's API.

GitHub Repository	Coming soon...
Public Maven repo	https://bintray.com/devexperts/Maven/jagent
License	GPLv3
Contact	dxlab@devexperts.com

Class redefining

By default, java agents don't redefine already loaded classes. Standard API has method `java.lang.instrument.Instrumentation#redefineClasses(ClassDefinition... definitions)` to redefine them. But it's impossible to redefine some classes (for example, `java.lang.String`) using this method.

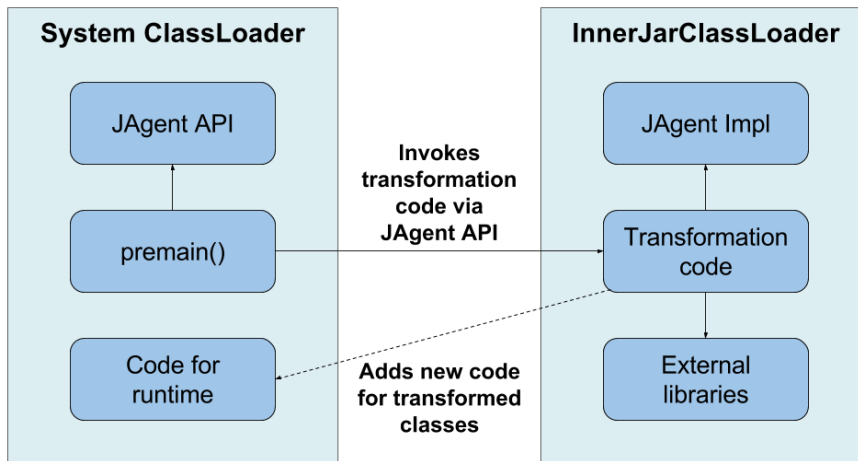
JAgent has it's own implementation of redefinition logic and allows to redefine all classes. But make careful with transforming classes from `java.*` package because of invalid transformation can cause strange errors into JVM code (segmentation fault, for example).

Own classloader

JAgent has `InnerJarClassLoader` which is used to load transformation code and libraries via custom class loader. What is it for?

If you have 2 agents that uses library XXX with different versions then you have a version conflict. But it is all right if you load them under different class loaders. Use `InnerJarClassLoader` to load your transformation code and external libraries for it.

See scheme below to understand how to write java agents with this feature:



Fast logging

Every `JAgent` instance has a `Log` object which is used to write logs efficiently. You can use `JAgent#getLog()` method to get the `Log` object for your purposes.

Logs are written according to following format: `2016-02-10T02:48:19.902+0300 <agent_name>: <message>`

Sample

You can find `sample` module in source code to see how to use **JAgent** for implementing your own java agent.

Maven

Here is a guide how to create java agents via **JAgent** with *Maven*.

If you use `InnerJarClassLoader` then you should use 4 modules in your agent code: ***core - contains code that runs transformation and new code for runtime** * transformer - **contains transformation logic** * agent - **builds agent's jar, no code here** * test** - tests for your agent

transformer module

Contains code that is executable in transformation phase. Should have `com.devexperts.jagent:jagent-impl` as dependency. This code with dependencies is loaded under `InnerJarClassLoader`.

com.agent.package.YourJAgentImpl.java

Implementation of `JAgent` abstract class. This implementation is used in `com.agent.package.AgentRunner` code.

```
public class YourJAgentImpl extends JAgent {

    public YourJAgentImpl(Instrumentation inst, String agentArgs) {
        super(inst, JAgentUtil.getImplTitle(YourJAgentImpl.class), JAgentUtil.getImplVersion(YourJAgentImpl.class));
        setLogLevel(Log.Level.DEBUG);
        addTransformer(new SuperNanoTransformer(...));
    }
}
```

pom.xml example:

Just contains needful dependencies for transformation.

```
<dependencies>
  <dependency>
    <groupId>com.devexperts.jagent</groupId>
    <artifactId>jagent-impl</artifactId>
    <version>1.0</version>
  </dependency>
  <dependency>
    <groupId>org.ow2.asm</groupId>
    <artifactId>asm-all</artifactId>
    <version>5.0.4</version>
  </dependency>
</dependencies>
```

core module

Contains code that runs transformation and new code for runtime. All classes from this module will be available via system class loader.

MANIFEST.MF

Configures agent information and permissions.

```
Premain-Class: com.agent.package.AgentRunner
Can-Redefine-Class: true
Boot-Class-Path: ${agent.artifact.name}.jar
```

```
Name: com/agent/package
Implementation-Title: ${agent.artifact.name}
Implementation-Version: ${project.version}
Implementation-Vendor: <your company>
```

com.agent.package.AgentRunner.java

Runs transformation code via `JAgentRunner`.

```
public class AgentRunner {
    public static void premain(String agentArgs, Instrumentation inst) throws Exception {
        JAgentRunner.runAgent("com.agent.package.YourJAgentImpl", inst, agentArgs,
            // All jars are located into your_agent.jar
            InnerJarClassLoader.createForJars("jagent-impl.jar", "transformer.jar", "asm-all.jar"));
    }
}
```

pom.xml example:

Builds jar with specified *MANIFEST.MF* and uses *maven-shade-plugin* to get rid of problems with different *jagent-api*'s versions in several java agents.

```
...
<build>
  <!-- Processes resources directory to replace Maven's variables to theirs values -->
  <resources>
    <resource>
      <directory>src/main/resources</directory>
      <filtering>true</filtering>
    </resource>
  </resources>
  <!-- Builds jar with specified MANIFEST.MF file-->
  <plugins>
    <plugin>
      <artifactId>maven-jar-plugin</artifactId>
      <configuration>
        <archive>
          <addMavenDescriptor>>false</addMavenDescriptor>
        </archive>
        <useDefaultManifestFile>true</useDefaultManifestFile>
      </configuration>
    </plugin>
    <!-- maven-shade-plugin is used for relocating "jagent-api" classes.
         It's necessary when you use "jagent-api" in several agents
         to get rid of conflict with different "jagent-api" versions. -->
    <plugin>
      <artifactId>maven-shade-plugin</artifactId>
      <executions>
        <execution>
          <phase>package</phase>
          <goals>
            <goal>shade</goal>
          </goals>
          <configuration>
            <artifactSet>
              <includes>
                <include>com.devexperts.jagent:jagent-api</include>
              </includes>
            </artifactSet>
            <relocations>
              <relocation>
                <pattern>com.devexperts.jagent.api</pattern>
                <shadedPattern>com.agent.package.shaded.com.devexperts.jagent.api</shadedPattern>
              </relocation>
            </relocations>
          </configuration>
        </execution>
      </executions>
    </plugin>
  </plugins>
</build>

<dependencies>
  <dependency>
    <groupId>com.devexperts.jagent</groupId>
    <artifactId>jagent-api</artifactId>
    <version>1.0</version>
  </dependency>
</dependencies>
...
```

agent module

This module contains only *pom.xml* to build *your_agent.jar*.

***pom.xml* example:**

Unpacks core classes and adds *transformer*, *jagent-impl* and external libraries JARs to *your_agent.jar*. These JARs are loaded via *InnerJarClassLoader*.

```

<build>
  <!-- DO NOT RENAME because of "Boot-Class-Path" section in MANIFEST.MF -->
  <finalName>${agent.artifact.name}</finalName>
  <plugins>
    <!-- Firstly, maven-dependency-plugin unpacks "core" module
    and copies all other dependencies to it's classpath.
    Classes from these dependencies will be loaded
    via InnerJarClassLoader from "core" module. -->
    <plugin>
      <artifactId>maven-dependency-plugin</artifactId>
      <executions>
        <execution>
          <id>copy-dependencies</id>
          <phase>prepare-package</phase>
          <goals>
            <goal>copy-dependencies</goal>
          </goals>
          <configuration>
            <excludeArtifactIds>core, jagent-api</excludeArtifactIds>
            <outputDirectory>${project.build.outputDirectory}</outputDirectory>
            <stripVersion>>true</stripVersion>
          </configuration>
        </execution>
        <execution>
          <id>unpack-dependencies</id>
          <phase>prepare-package</phase>
          <goals>
            <goal>unpack-dependencies</goal>
          </goals>
          <configuration>
            <includeArtifactIds>core</includeArtifactIds>
            <outputDirectory>${project.build.outputDirectory}</outputDirectory>
          </configuration>
        </execution>
      </executions>
    </plugin>
    <!-- Then, maven-jar-plugin builds jar with dependencies and
    specified MANIFEST.MF file (contains in "core" module). -->
    <plugin>
      <artifactId>maven-jar-plugin</artifactId>
      <configuration>
        <archive>
          <addMavenDescriptor>>false</addMavenDescriptor>
        </archive>
        <useDefaultManifestFile>>true</useDefaultManifestFile>
      </configuration>
    </plugin>
  </plugins>
</build>

<dependencies>
  <dependency>
    <groupId>com.agent.package</groupId>
    <artifactId>core</artifactId>
    <version>${project.version}</version>
  </dependency>
  <dependency>
    <groupId>com.agent.package</groupId>
    <artifactId>transformer</artifactId>
    <version>${project.version}</version>
  </dependency>
</dependencies>

```

test module

Contains tests for your agent. Here is an example for unit testing.

***pom.xml* example:**

Configures *maven-surefire-plugin* to run tests under your agent.

```
...
<plugins>
  <!-- maven-dependency-plugin is used to copy your agent into target directory -->
  <plugin>
    <artifactId>maven-dependency-plugin</artifactId>
    <executions>
      <execution>
        <id>copy-sample-agent</id>
        <phase>process-test-classes</phase>
        <goals>
          <goal>copy</goal>
        </goals>
        <configuration>
          <artifactItems>
            <artifactItem>
              <groupId>com.agent.package</groupId>
              <artifactId>your_agent</artifactId>
              <version>${project.version}</version>
              <outputDirectory>${project.build.directory}</outputDirectory>
              <destFileName>${agent.artifact.name}.jar</destFileName>
            </artifactItem>
          </artifactItems>
        </configuration>
      </execution>
    </executions>
  </plugin>
  <!-- Configure maven-surefire-plugin to use your agent -->
  <plugin>
    <artifactId>maven-surefire-plugin</artifactId>
    <configuration>
      <argLine>-javaagent:${agent.directory}/${agent.artifact.name}.jar</argLine>
    </configuration>
  </plugin>
</plugins>
...
```