

DEVOXX FRANCE

Le classpath n'est pas mort... mais presque

10:40- 11:30 - Salle Miles Davis

Le classpath n'est pas mort... mais presque

@AlexisHassler
Développeur, formateur indépendant



**DEVOXX
FRANCE**

27 au 29 mars 2013

"Classpath is dead!"

Mark Reinhold

JavaOne 2009



Classpath

Classloader

Mort ?

Successeur

Alexis Hassler

Développeur, formateur Java

Indépendant

Co-leader du



Classpath

Chercher les classes

```
String hello = "Bonjour Devoxx";  
MyStuff var;
```



-classpath

```
java -cp hello-lib.jar HelloWorld
```

Manifest

```
Manifest-Version: 1.0  
Class-Path: hello-lib.jar  
Main-Class: HelloWorld
```

Connaitre le classpath

```
System.getProperty("java.class.path");
```

Erreurs

`java.lang.NoClassDefFoundError`

`java.lang.ClassNotFoundException`

Classpath

Géré par des **classloaders**

Classloader

java.lang.ClassLoader

loadClass(String name) : Class<?>

getResource(String name) : URL

getResources(String name) : Enumeration<URL>

getResourceAsStream(String name) : InputStream

getParent() : ClassLoader

ClassLoader

`MyStuff.class.getClassLoader()`

`sun.misc.Launcher$AppClassLoader`



Bootstrap Classloader

```
classloader.getClass().getClassLoader()
```

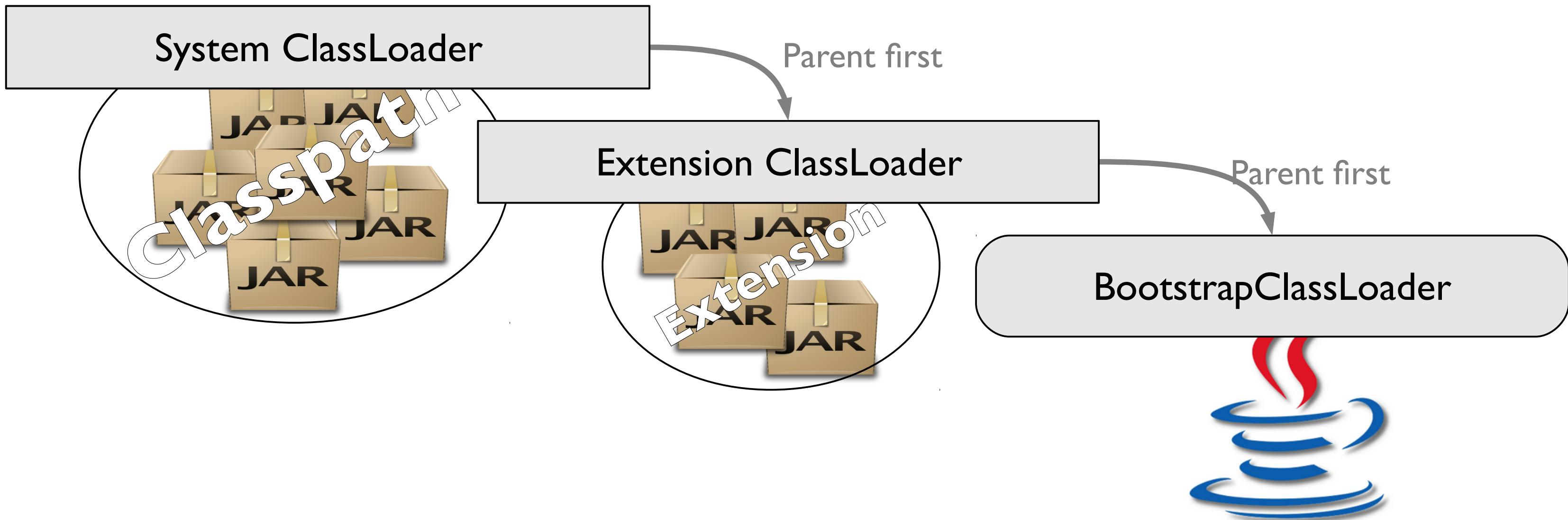
```
null
```

Bootstrap Classloader



BootstrapClassLoader

Délégation



Délégation

System ClassLoader



```
java -cp hello-lib.jar ...
```

```
System.getProperty("java.class.path");
```

Délégation

```
java -Djava.ext.dirs=~/java7/ext ...
```

Extension ClassLoader



```
System.getProperty("java.ext.dirs");
```

Délégation

Ext != Endorsed

Délégation

```
java -Xbootclasspath:hello-rt.jar ...
```

BootstrapClassLoader



```
System.getProperty("sun.boot.class.path");
```

bootclasspath

```
java -Xbootclasspath:hello-rt.jar ...
```

```
java -Xbootclasspath/a:hello-lib.jar ...
```

```
java -Xbootclasspath/p:hello-lib.jar ...
```

Endorsed

```
java -Djava.endorsed.dirs=~/java7/endorsed ...
```

BootstrapClassLoader



Endorsed

APIs standards hors JCP

org.omg (CORBA), org.w3c.dom, org.xml.sax (XML)

APIs standalone

JAXP, JAXB, Scripting, Compiler API,...

Démonstration

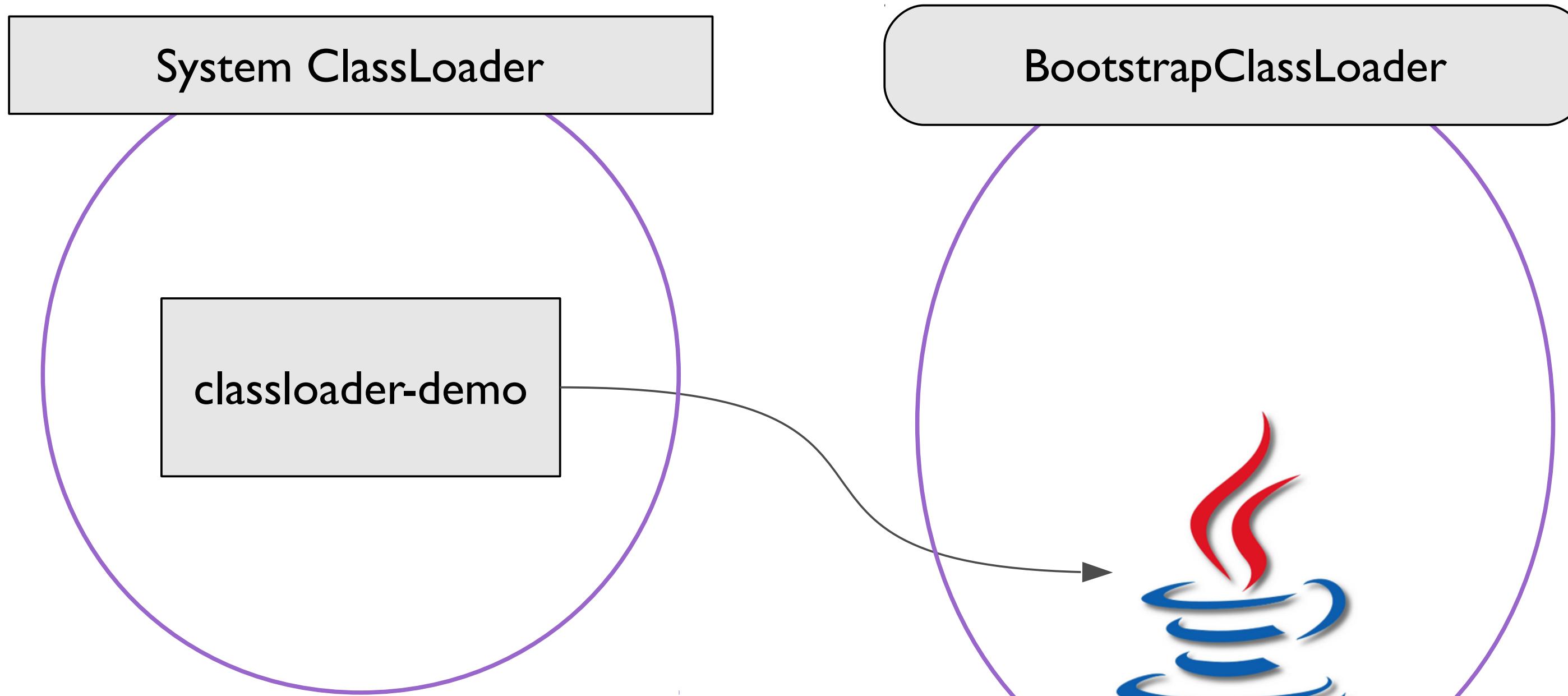
<http://github.com/hasalex/classpath-demo>



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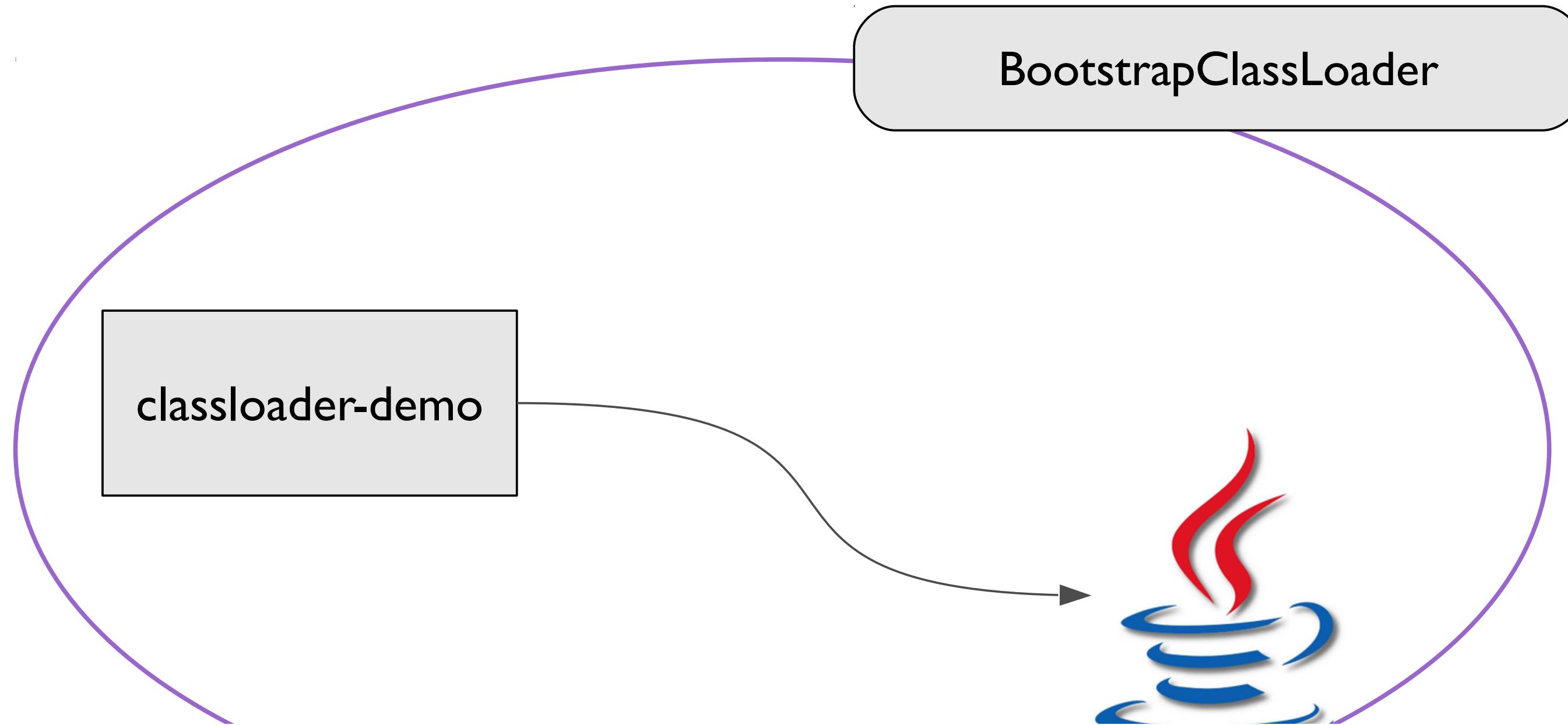
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Démonstration



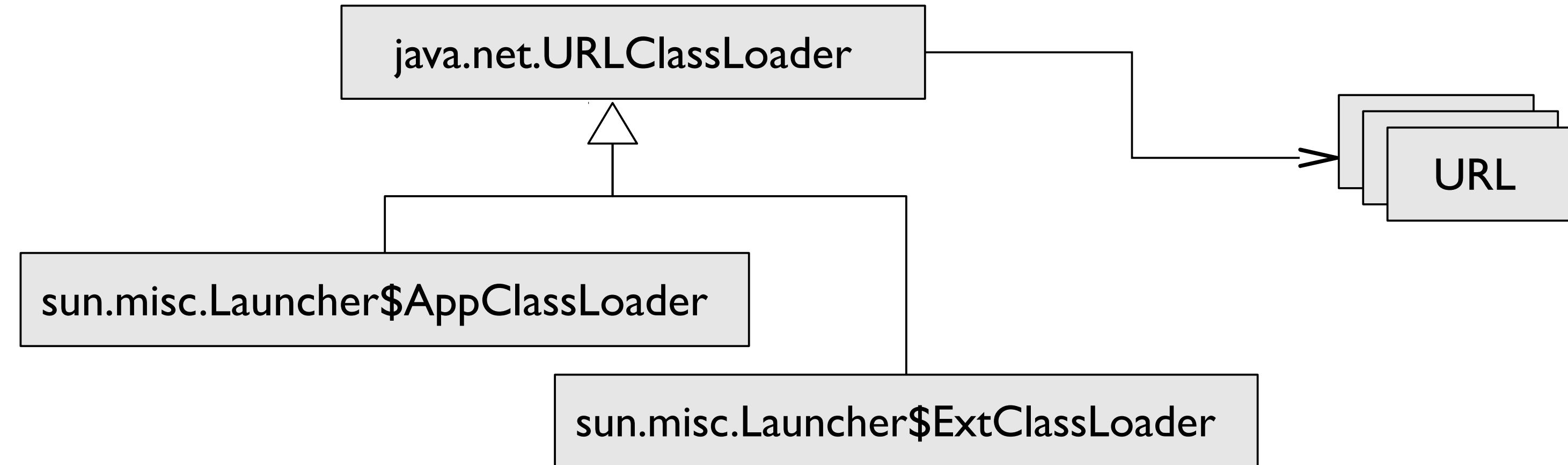
```
java -cp cl-demo.jar fr.sewatech.classpath.Count
```

Démonstration

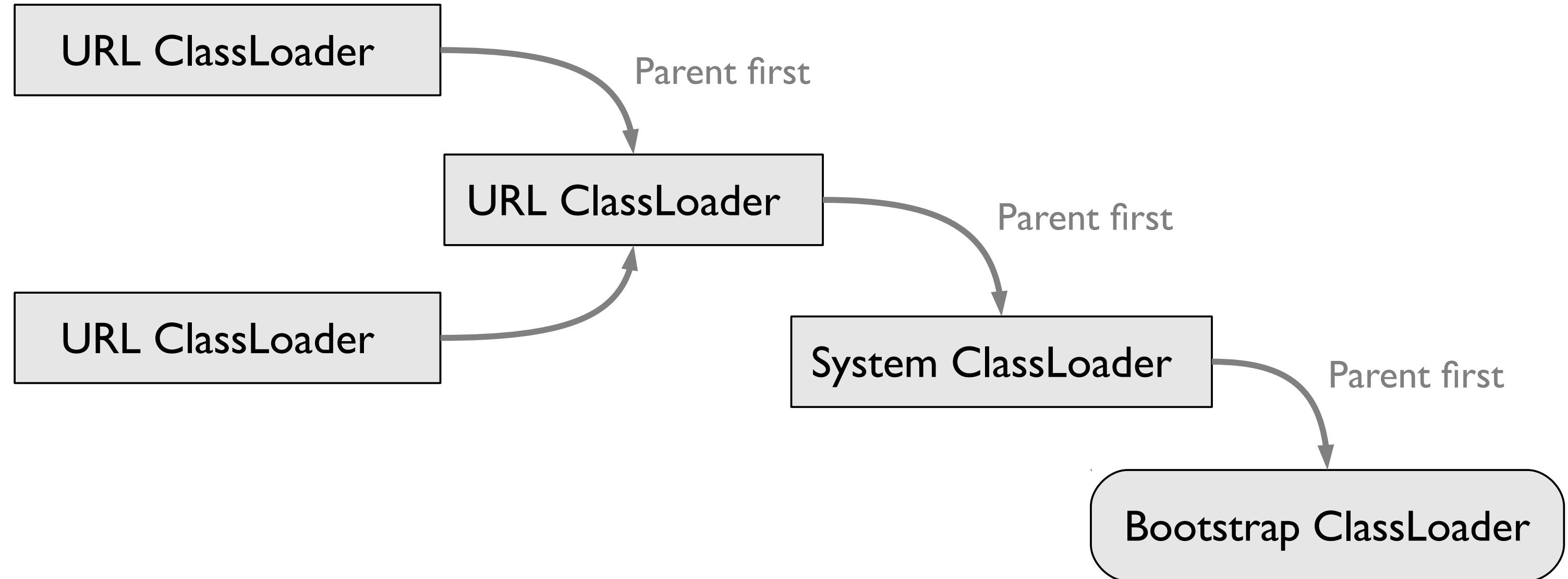


```
java -Xbootclasspath/p:lib/cl-demo.jar fr.sewatech.classpath.Count
```

URLClassLoader



URLClassLoader



FLTM Classloader

Fait Le Toi-Même

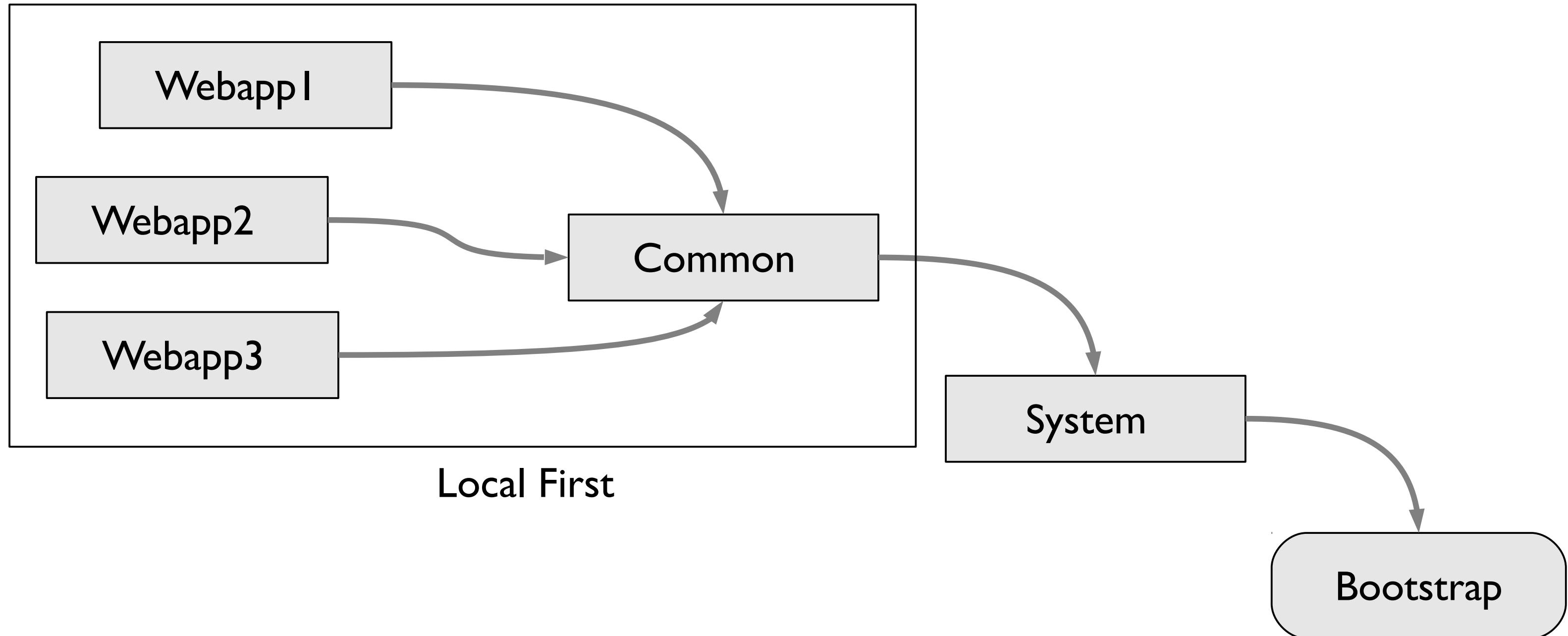
Usages

Application Servers

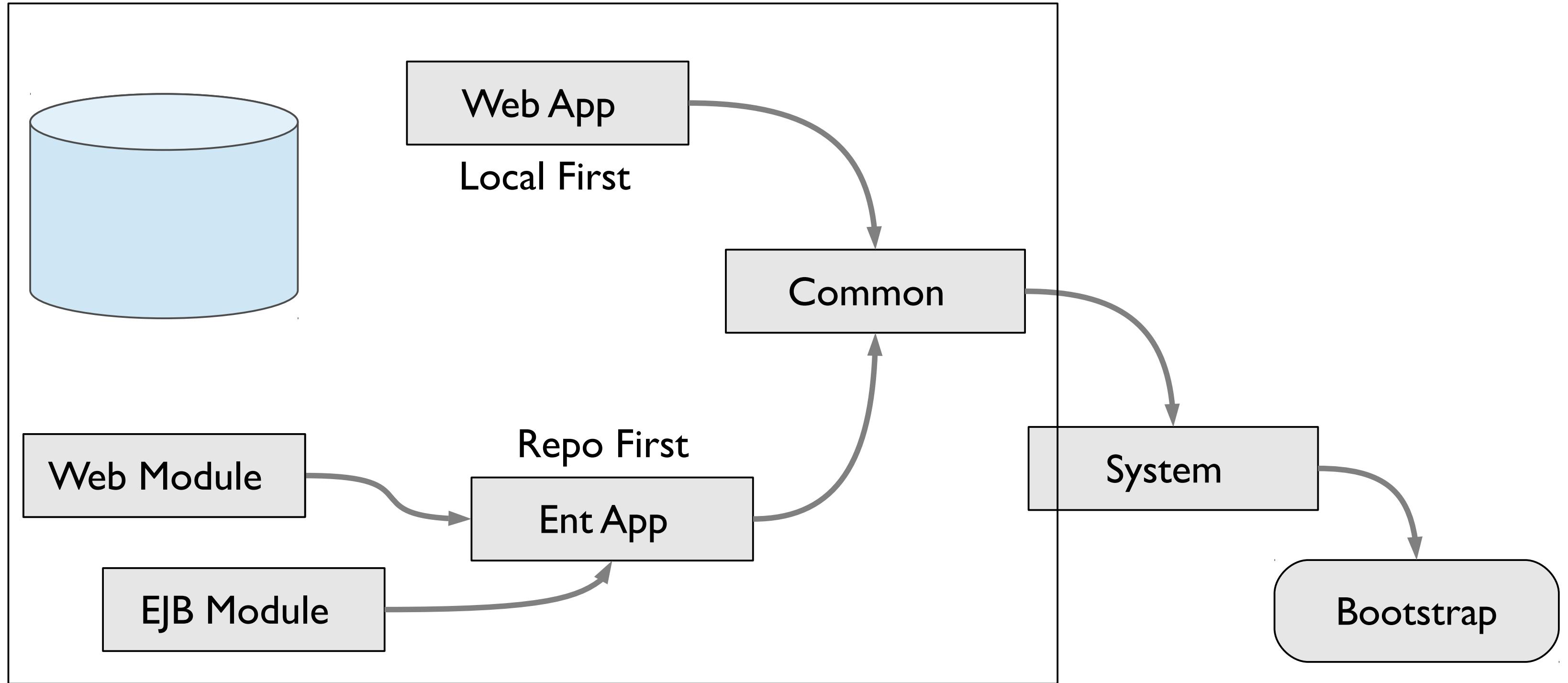
JRebel

Javassist, CGLib,...

Tomcat



JBoss AS 5



Erreurs

ClassCastException

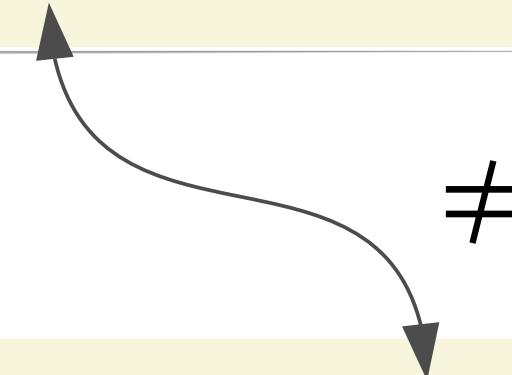
MyStuff cannot be cast to MyScuff



Erreurs

URL ClassLoader

```
MyStuff var = MyStuffFactory.build();
```



URL ClassLoader

```
return new MyStuff();
```

Démonstration

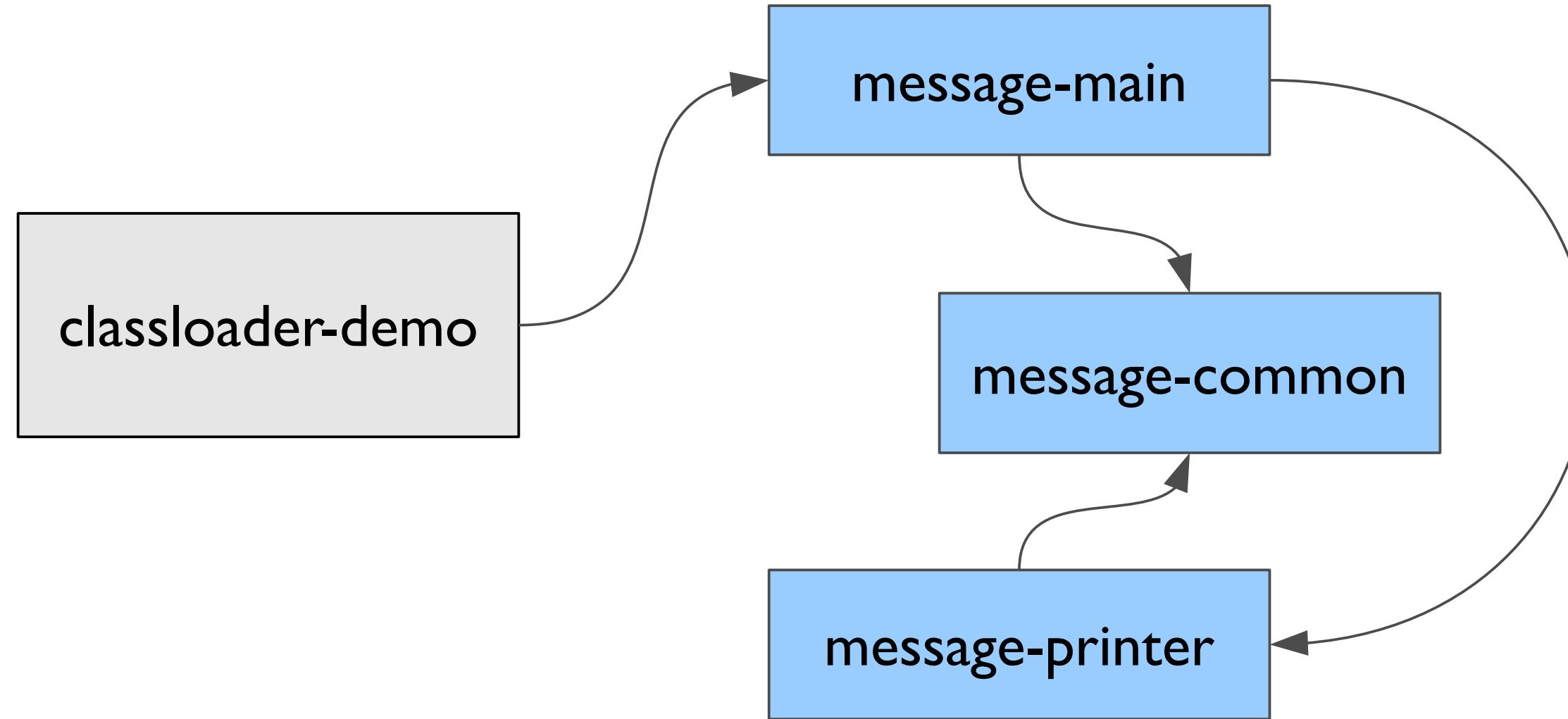
<http://github.com/hasalex/classpath-demo>



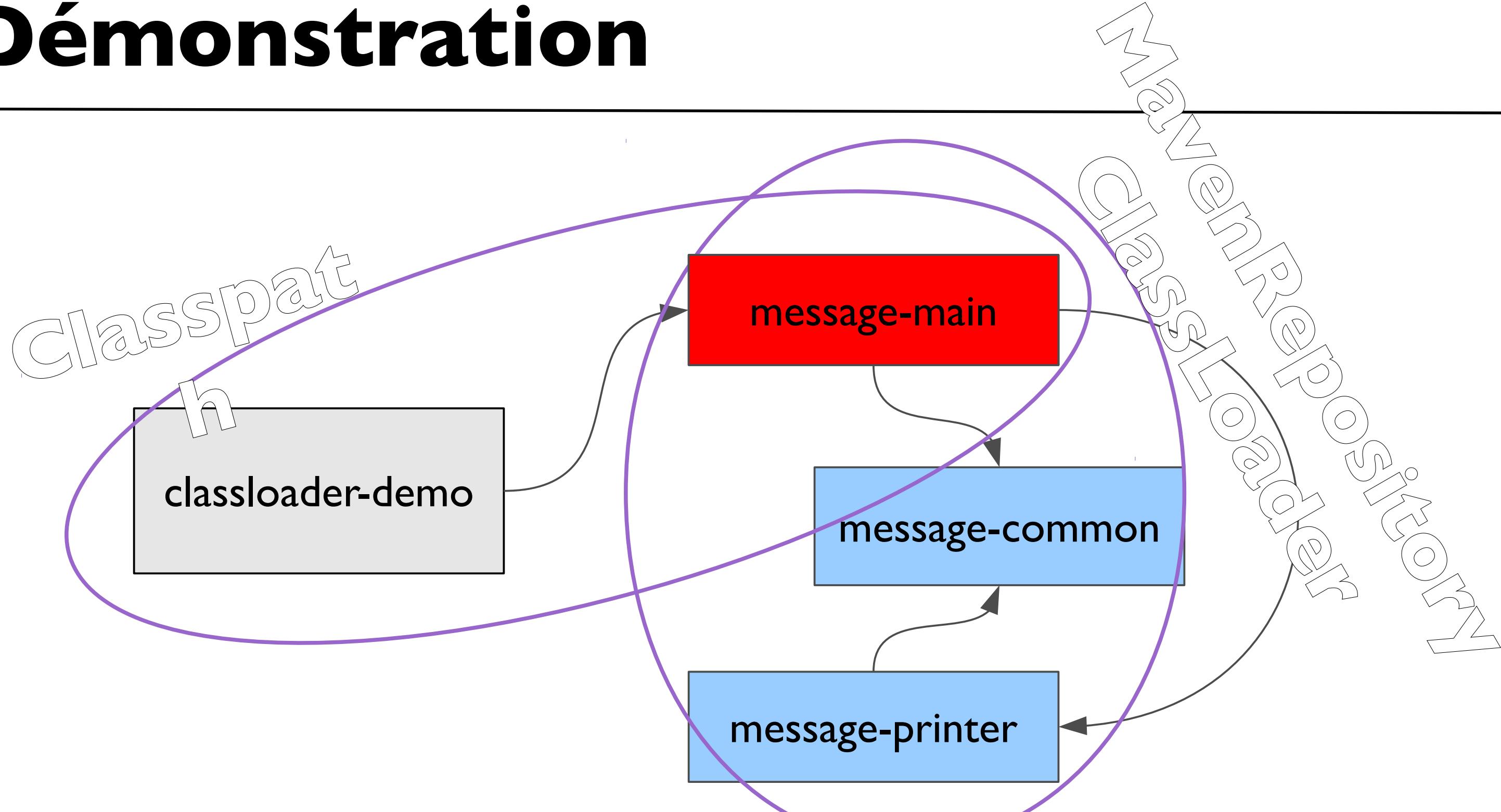
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Démonstration

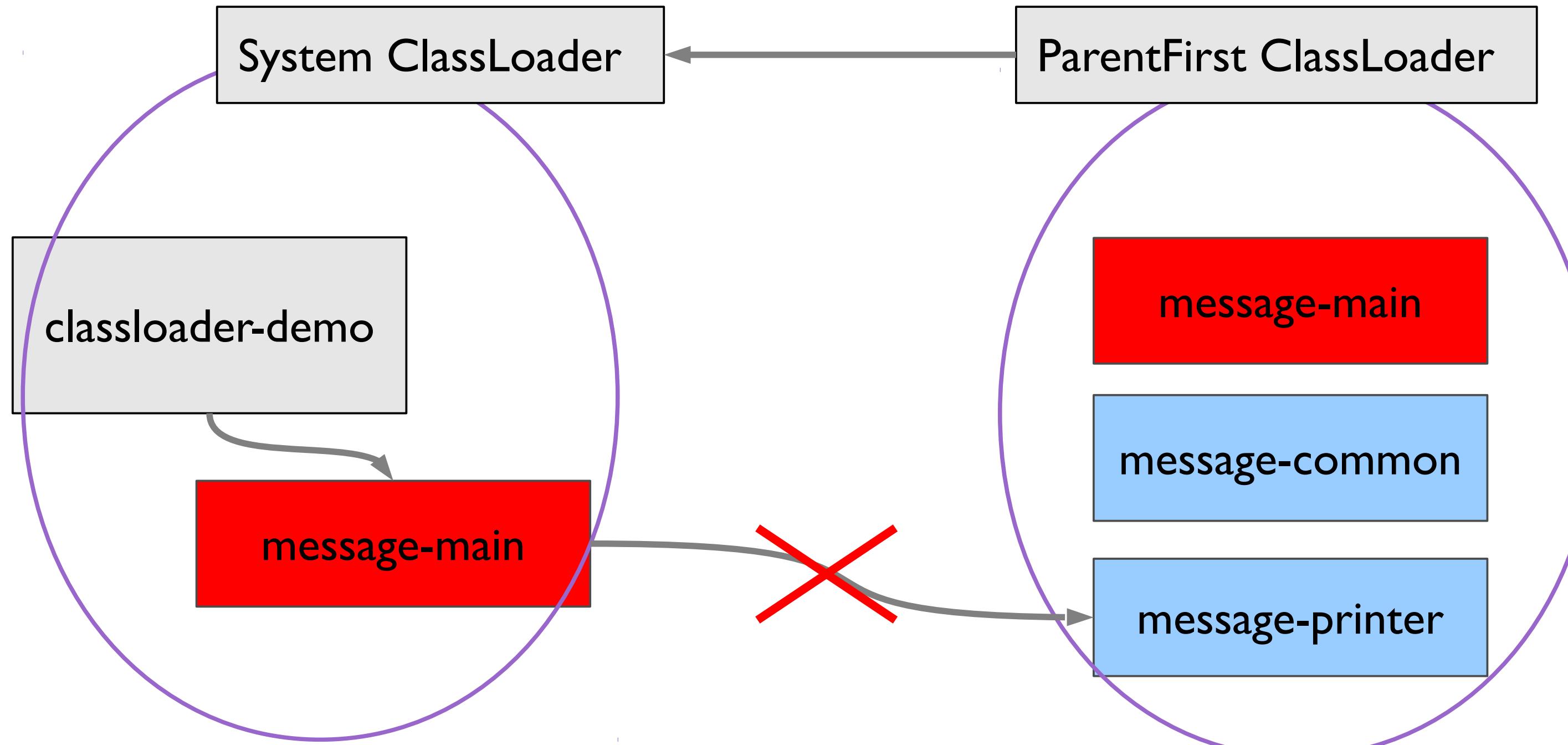


Démonstration

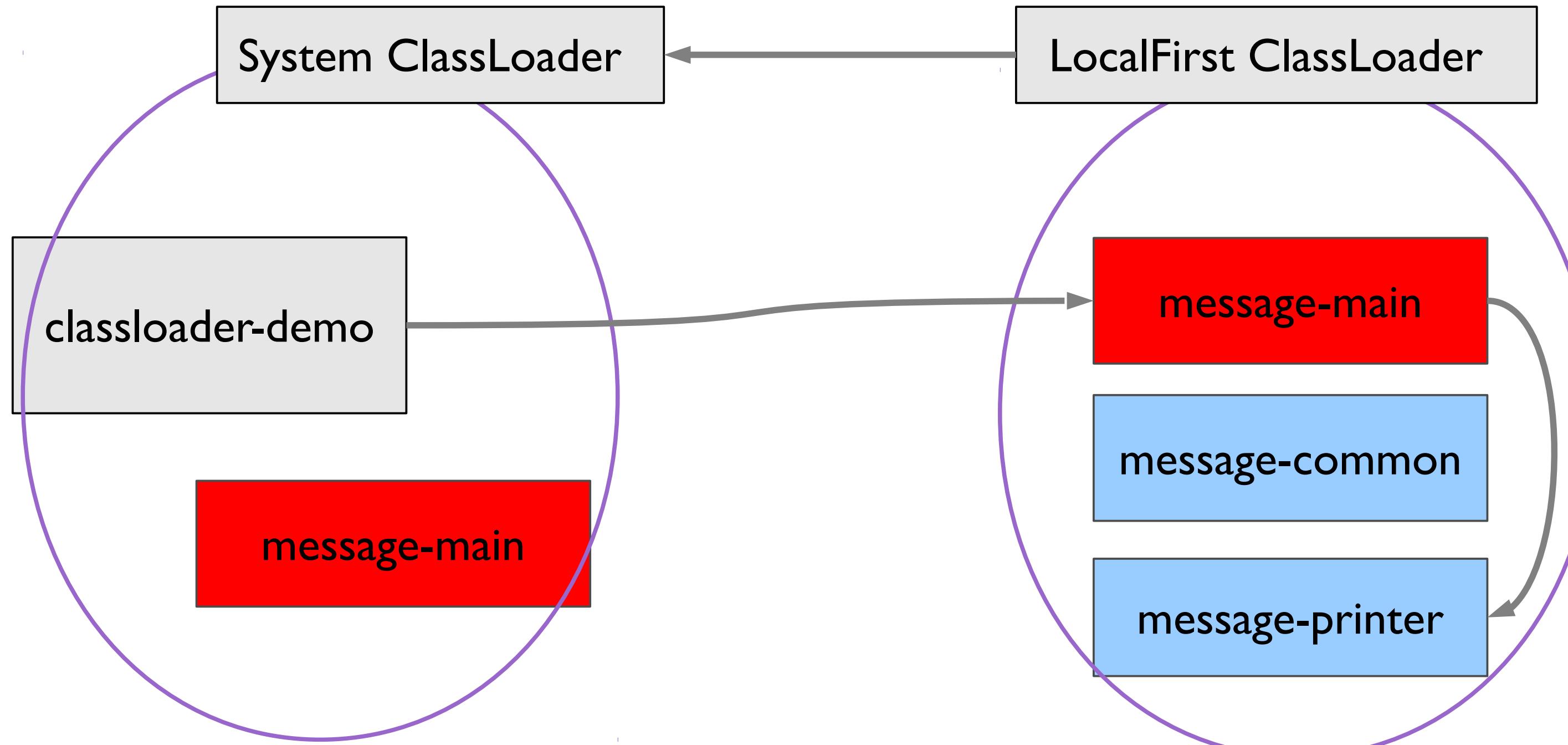


```
java -cp cl-demo.jar:msg-main.jar fr.sewatech.classpath.HelloViaMvnRepo
```

Démonstration



Démonstration



Mort



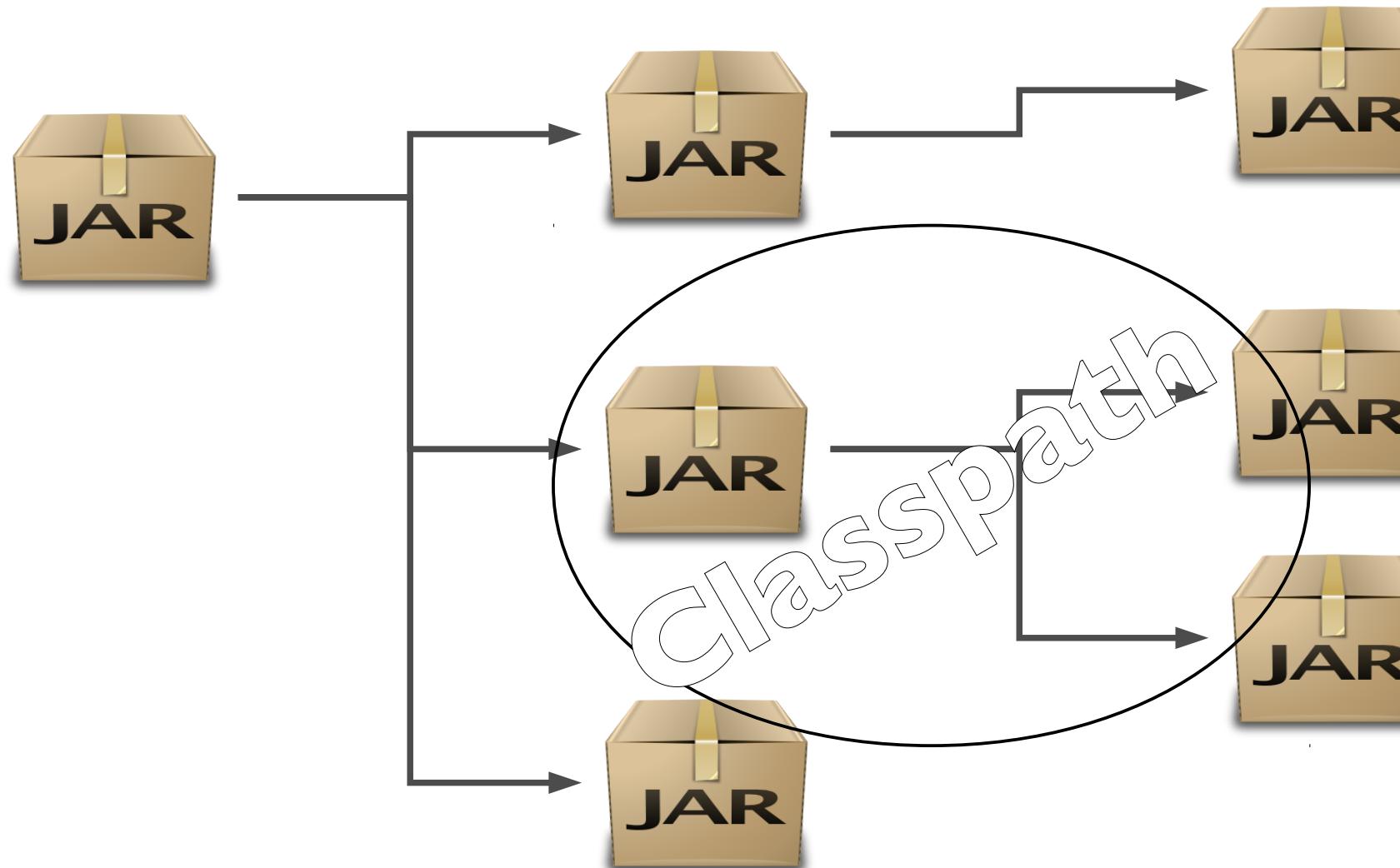
JAR
HELL

Dépendances

Maven, Gradle,...



Dépendances



Runtime

A plat

Fichiers jar
juste du stockage
pas ou peu de métadonnée



Runtime

Hiérarchique
applications server



Démonstration

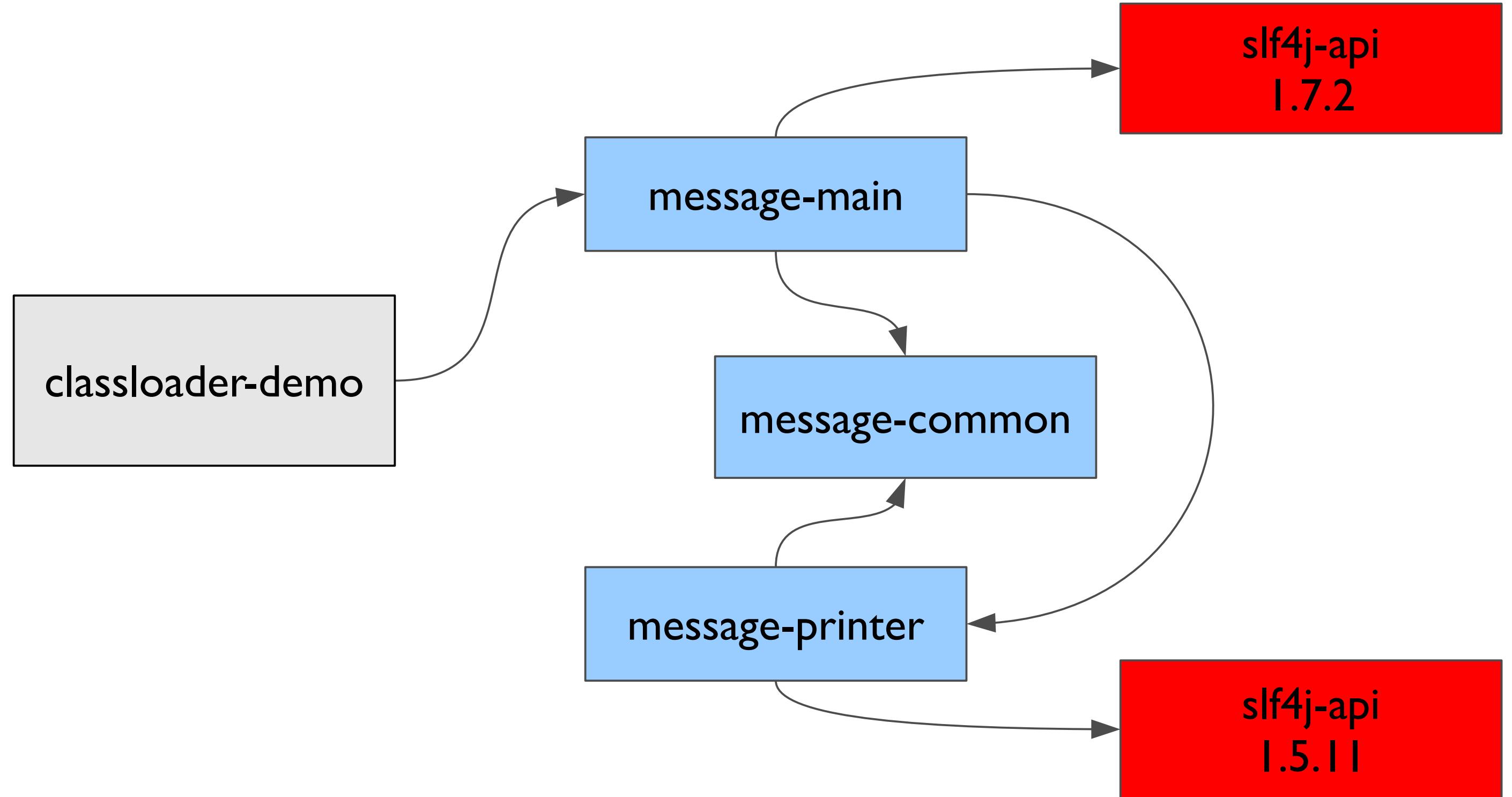
<http://github.com/hasalex/classpath-demo>



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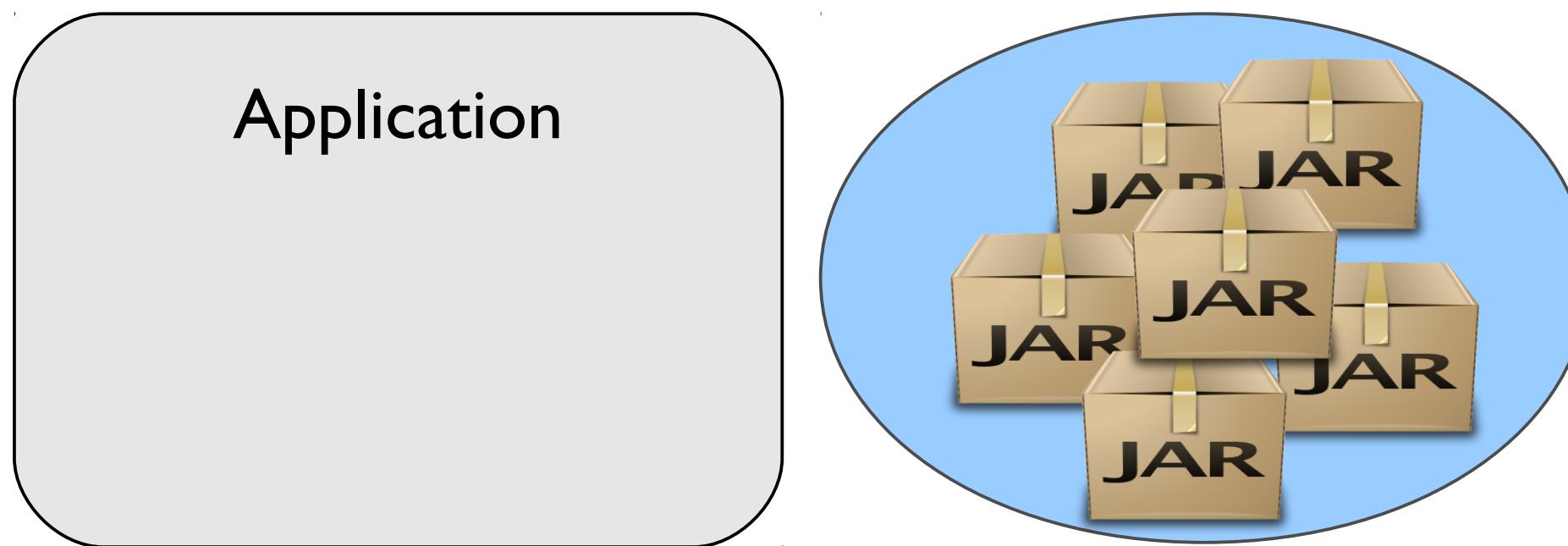
Démonstration



Remplaçant

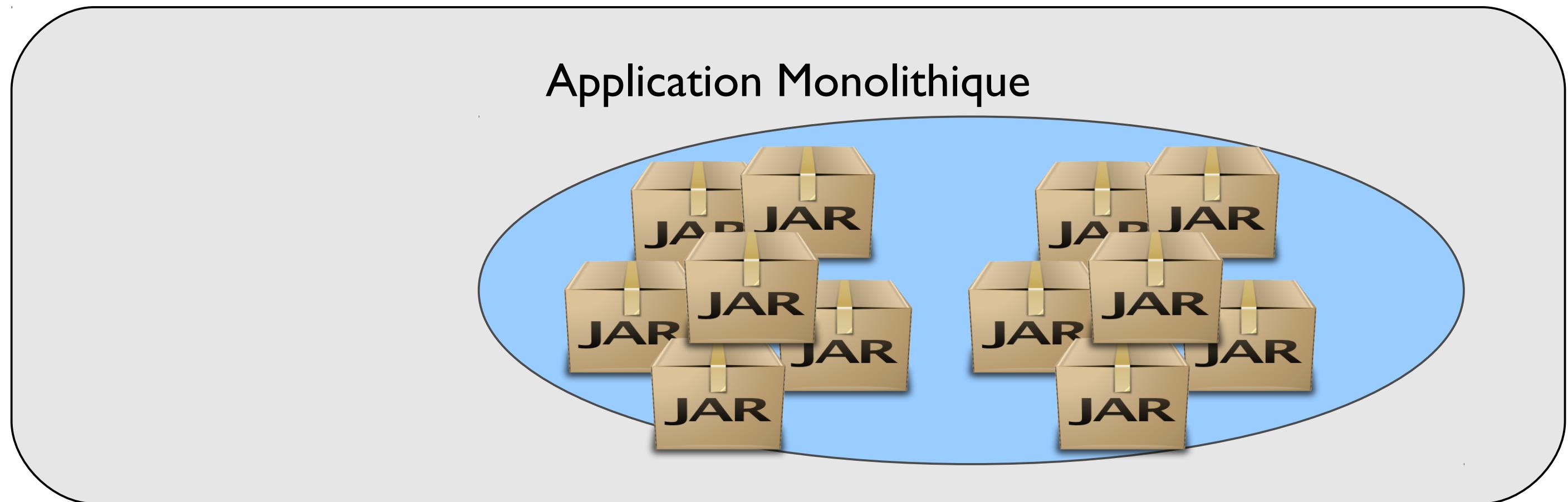
Granularité

Classpath



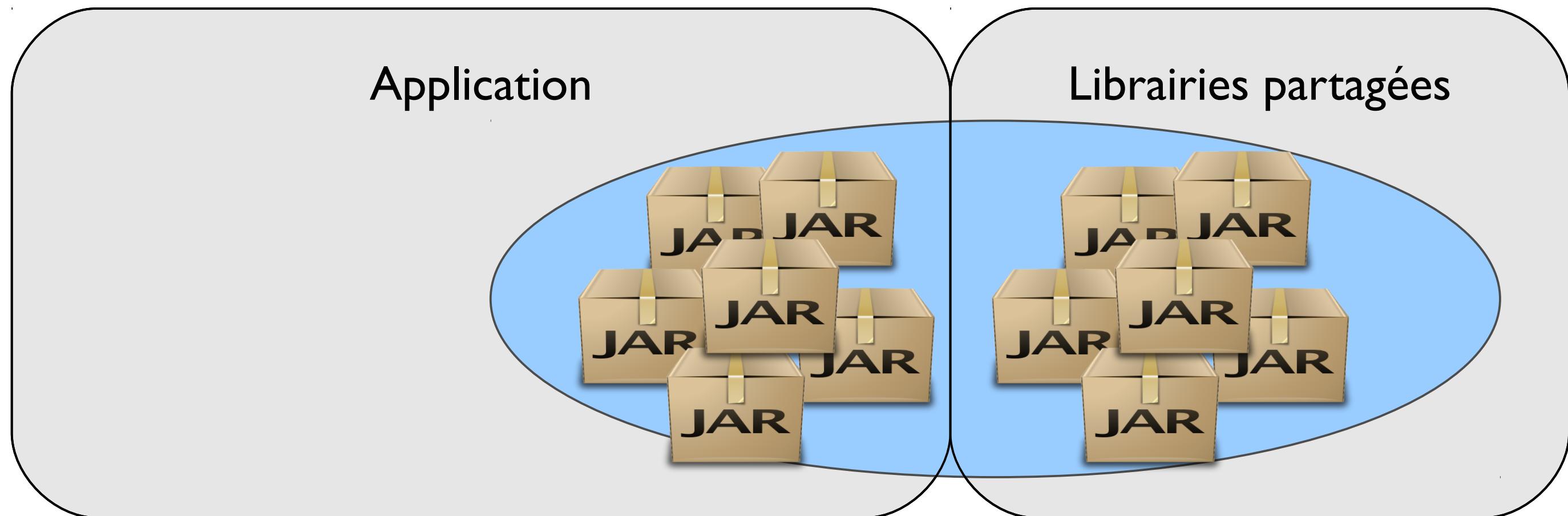
Granularité

Application Web / JavaEE



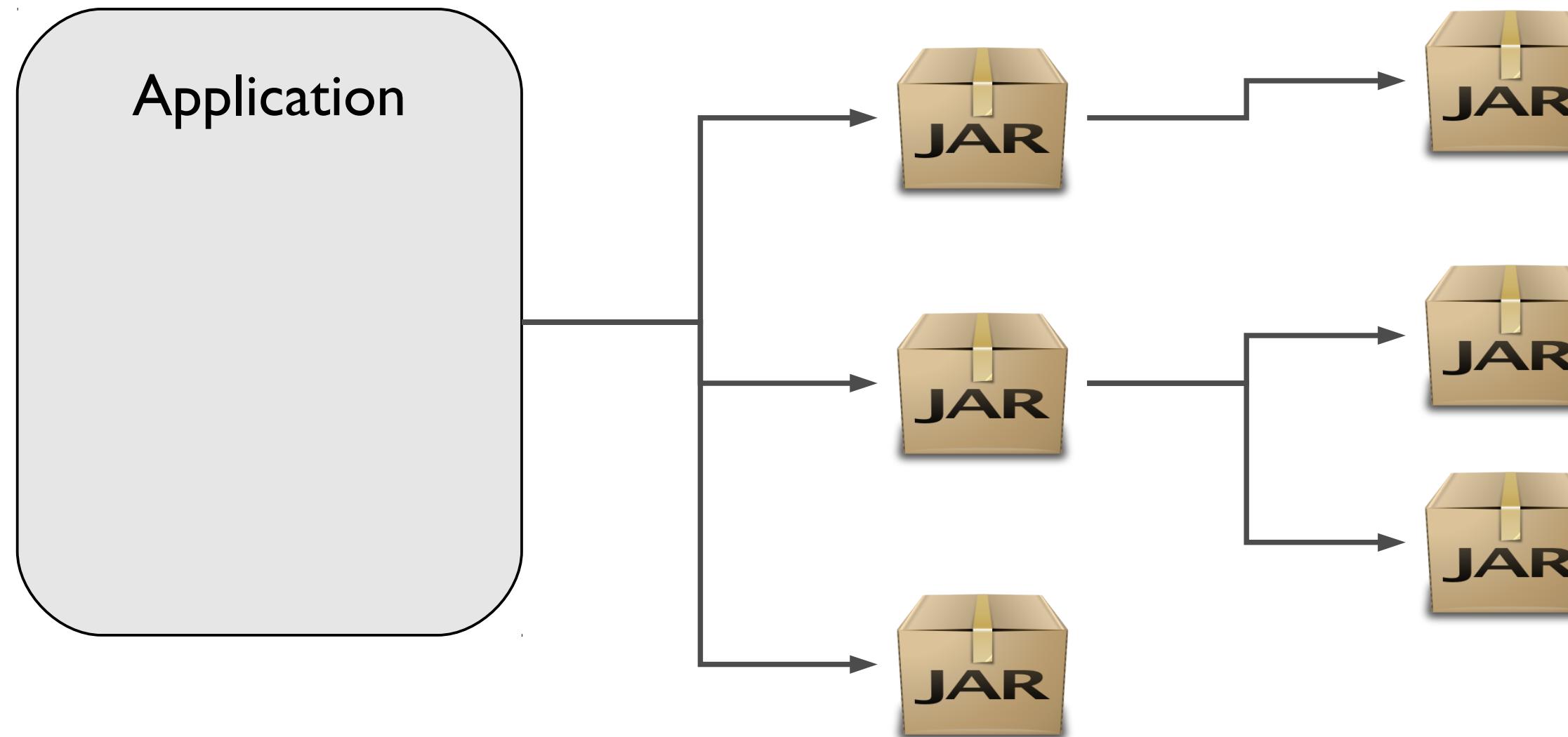
Granularité

Application Web / JavaEE



Modularité

Application Web / JavaEE



Modularité

Visibilité

Import

Export

Dépendances transitives



I 999

Java embarqué

Java SE

Java serveur

Bundle

Fichier jar

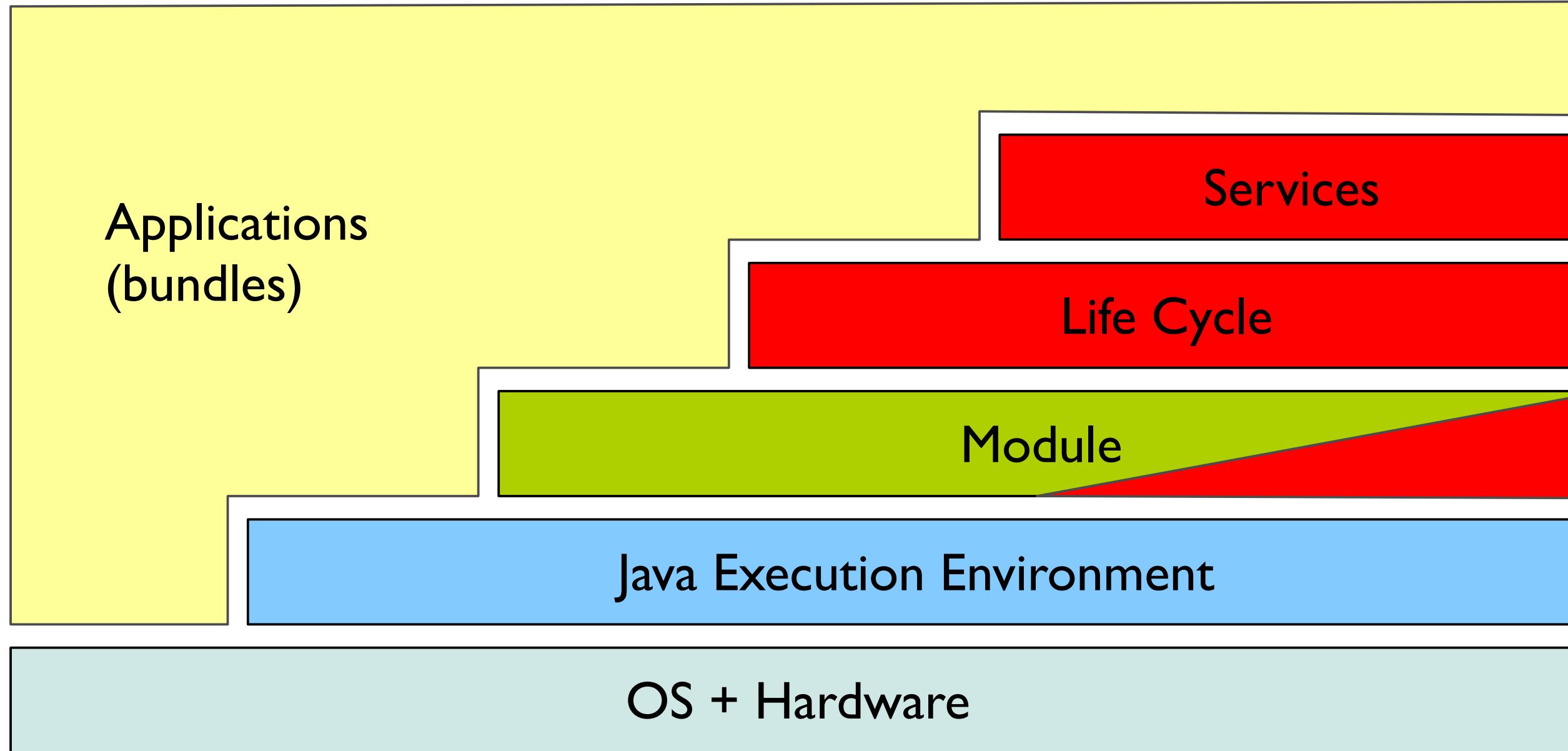
META-INF/MANIFEST.MF

Import / export de **packages**

OSGi

```
Bundle-Name = Simple Bundle
Bundle-SymbolicName = simple-bundle
Bundle-Description = Simple Bundle.
Export-Package = fr.sewatech.mystuff.services
Import-Package = org.osgi.framework;version=1.3
Bundle-Version = 1.0.1
```

OSGi



OSGi

Apporte de la valeur

=> applications hautement dynamiques

Apporte de la complexité

=> outils pour gérer la complexité

Jigsaw

Projet OpenJDK

Intégré au JDK ~~7 (2008)~~ ~~8 (2012)~~ 9 (2015) ...

Jigsaw

Modularité des applications

Modularité du JDK

Jigsaw

Dépendance à une partie du JDK

Plus besoin de Corba pour Hello World

Plus besoin de Swing pour Tomcat

Repository

Téléchargement automatique des modules

Jigsaw

module-info.java

```
module message-main @ 1.0 {  
    exports fr.sewatech.message;  
    requires fr.sewatech.message-common @ 1.1;  
    class fr.sewatech.message.Main;  
}
```



#h@cking fast.

JBoss Modules

Sous-projet de JBoss AS 7

Inspiré de Jigsaw

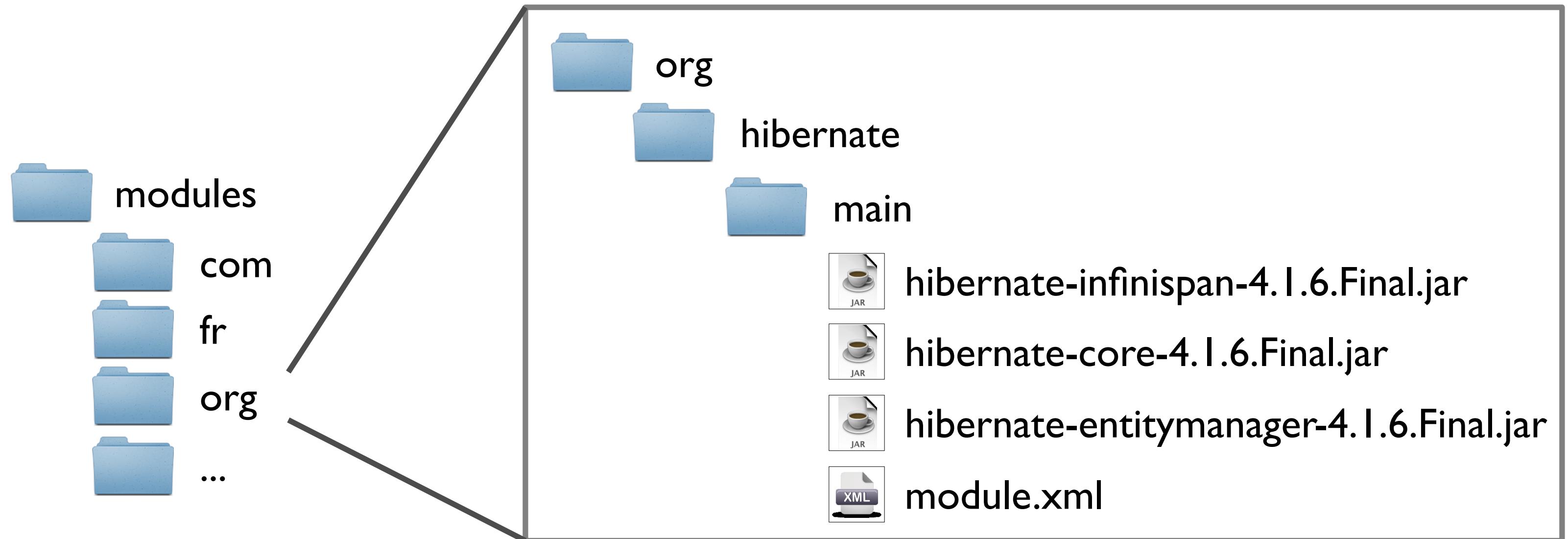
Base de JBoss OSGi

JBoss Modules

Java SE

```
java -jar jboss-modules.jar -mp path/to/modules  
my.main.module.name
```

JBoss Modules



JBoss Modules

```
<?xml version="1.0" encoding="UTF-8"?>
<module xmlns="urn:jboss:module:1.1"
         name="fr.sewatech.conference.classloader-demo">
    <main-class name="fr.sewatech.classpath.Hello"/>
    <resources>
        <resource-root path="classloader-demo-1.0-SNAPSHOT.jar"/>
    </resources>
    <dependencies>
        <module name="fr.sewatech.conference.message-main" />
    </dependencies>
</module>
```

```
<?xml version="1.0" encoding="UTF-8"?>
<module xmlns="urn:jboss:module:1.1" name="org.hibernate">
  <resources>
    <resource-root path="hibernate-core-4.0.0.Final.jar"/>
    <resource-root path="hibernate-commons-annotations-4.0.1.Final.jar"/>
    <resource-root path="hibernate-entitymanager-4.0.0.Final.jar"/>
  </resources>
  <dependencies>
    <module name="javax.api"/>
    <module name="javax.persistence.api"/>
    <module name="javax.transaction.api"/>
    <module name="org.apache.commons.collections"/>
    <!-- ... -->
  </dependencies>
</module>
```

Démonstration

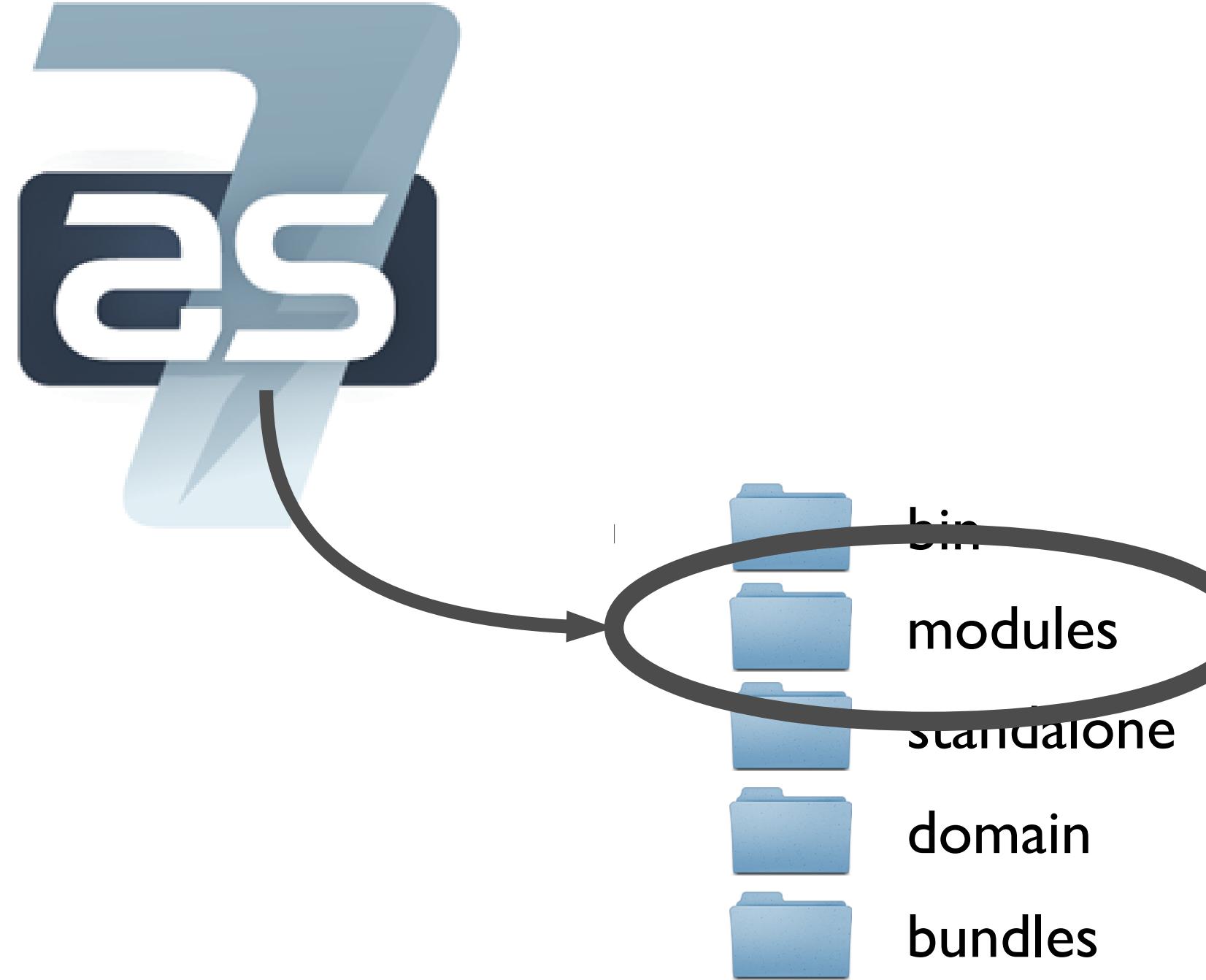
<http://github.com/hasalex/classpath-demo>



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JBoss AS 7



Scripts de démarrage

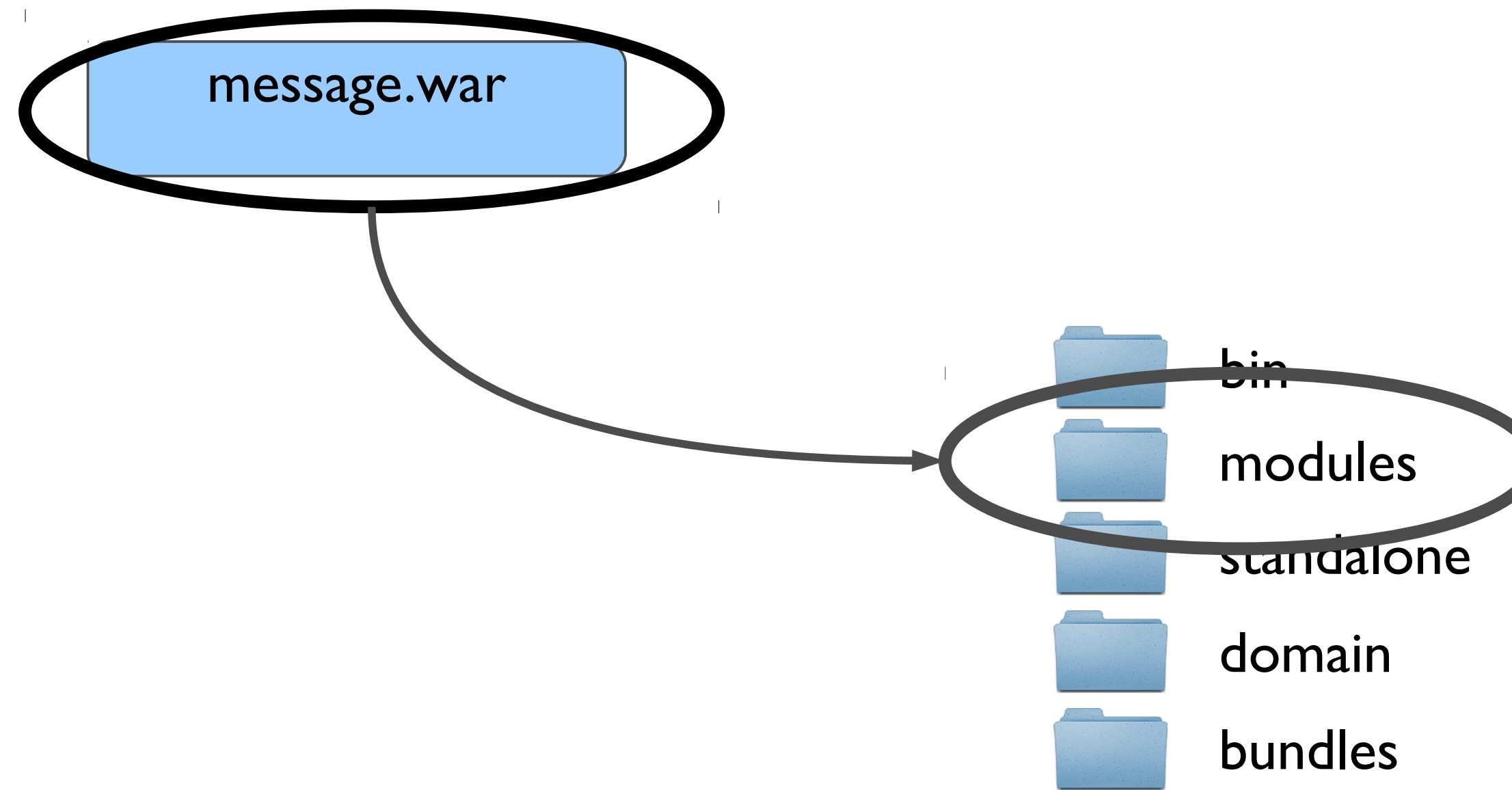
Modules JBoss

Profil standalone

Profil domain

Composants OSGi

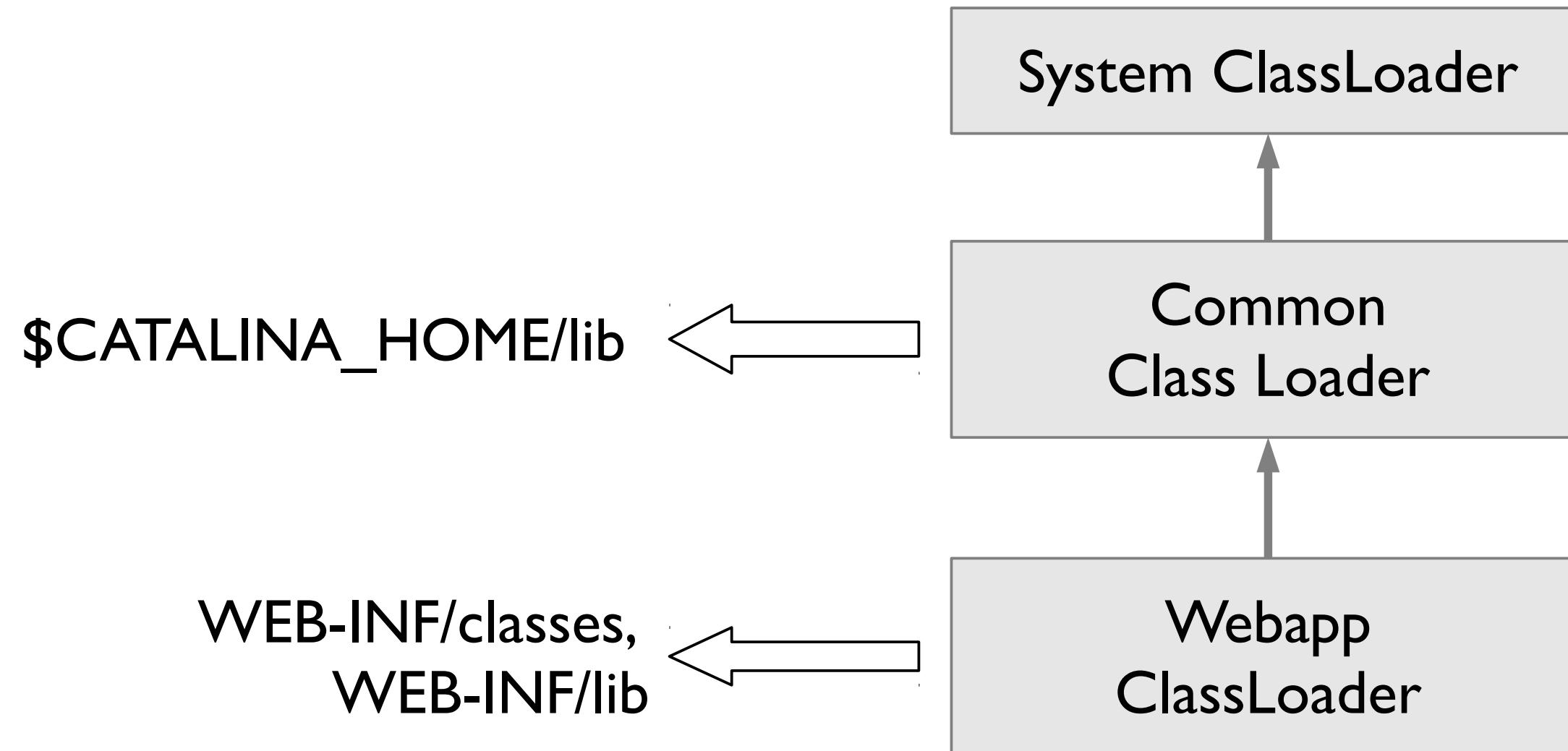
JBoss AS 7



Scripts de démarrage
Modules JBoss
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Profil domain
Composants OSGi

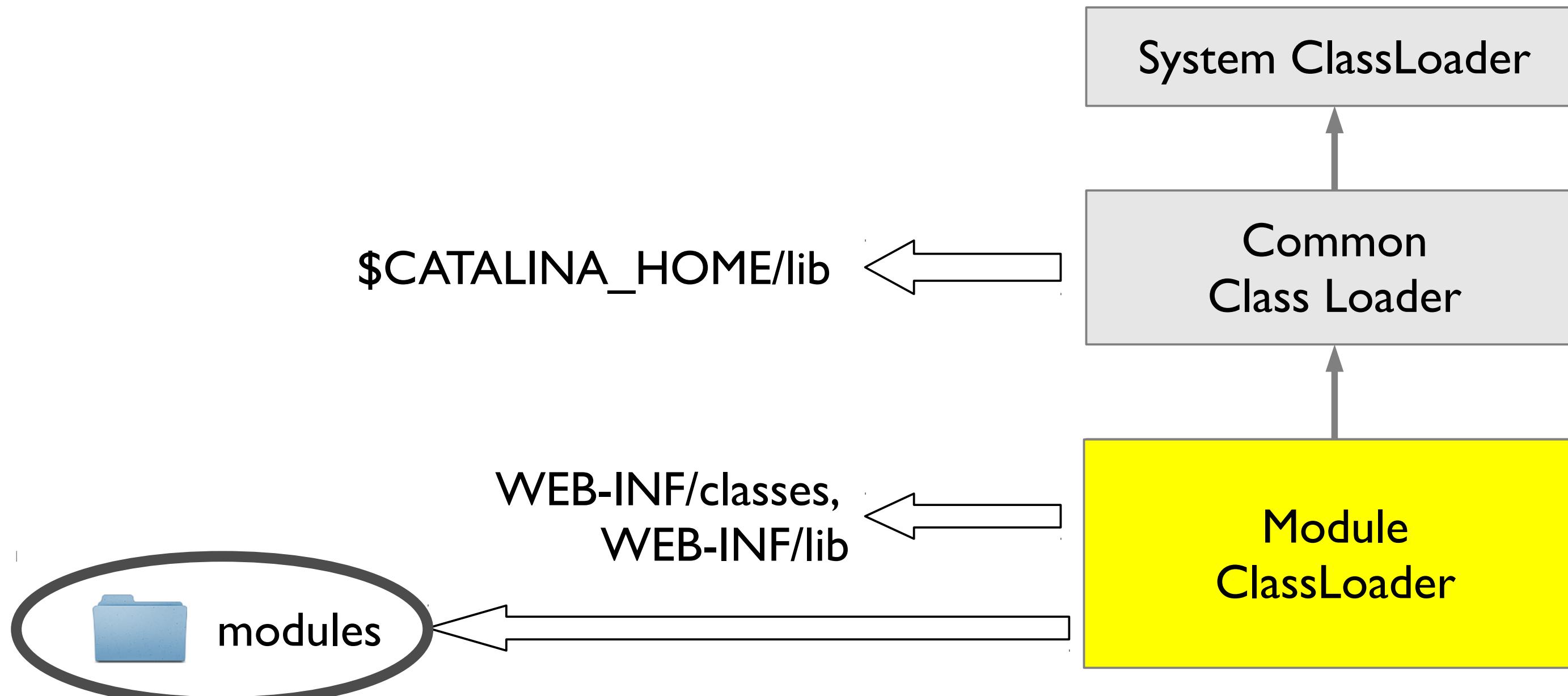
Tomcat

Classloading



Tomcat

Module ?



Tomcat

A suivre...

<https://github.com/hasalex/tomcat-modules>

Démonstration

<http://github.com/hasalex/classpath-demo>



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Cible

Applications complexes

Beaucoup de réutilisation

Développement / déploiement

Artefacts ≠ Modules

Notions différentes

Outilage difficile

En attendant Jigsaw ?

Merci



Questions / Réponses



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