DO YOU REALLY GET CLASSLOADERS?

SIMON MAPLE

@SJMAPLE

ZEROTURNAROUND

BACKGROUND: JREBEL

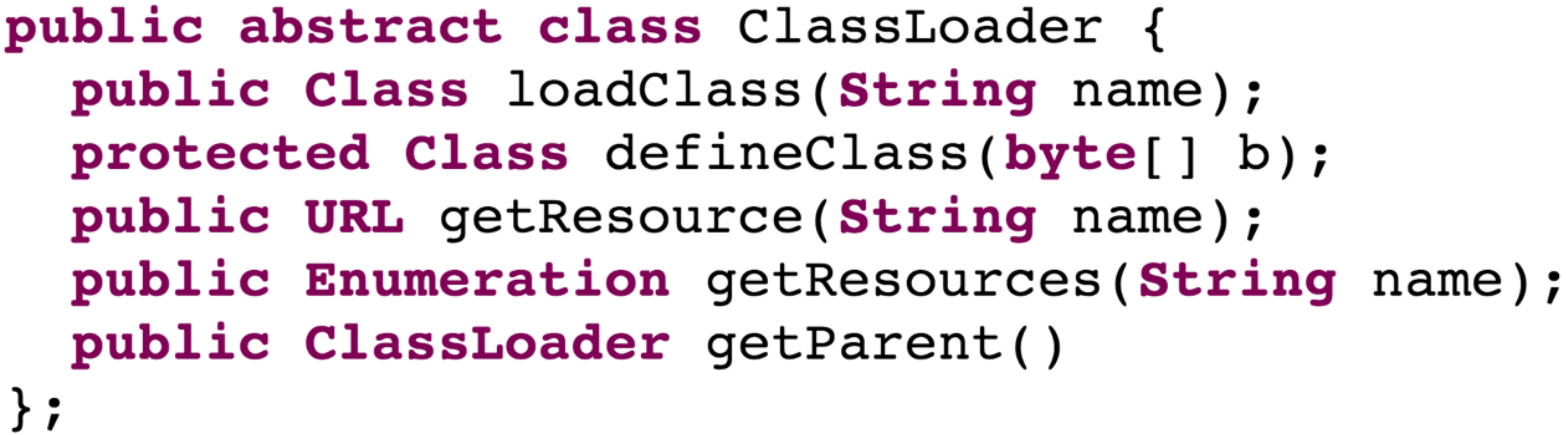
- Hooked into class loading on the JVM level
- Integrated with the class loading mechanism in more than 20 different servers
- Solved hundreds of issues connected to class loading
- Learned a lot more about class loaders than we wanted to ☺

PLAN

- Basics
- What is class loading?
- How was it meant to work?
- Problems and solutions
- How do class loaders leak?
- Modern solutions

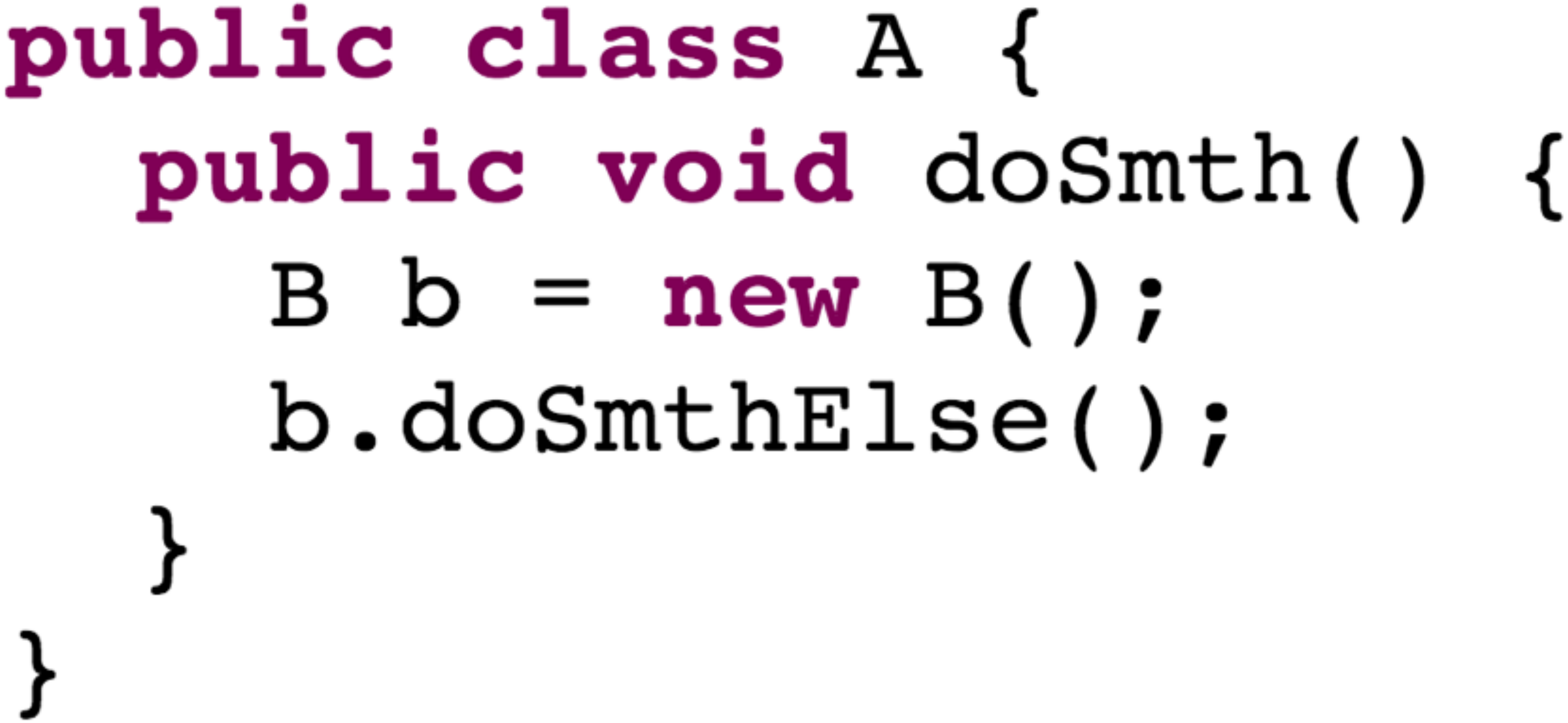
BASICS

JAVA.LANG.**CLASSLOADER**



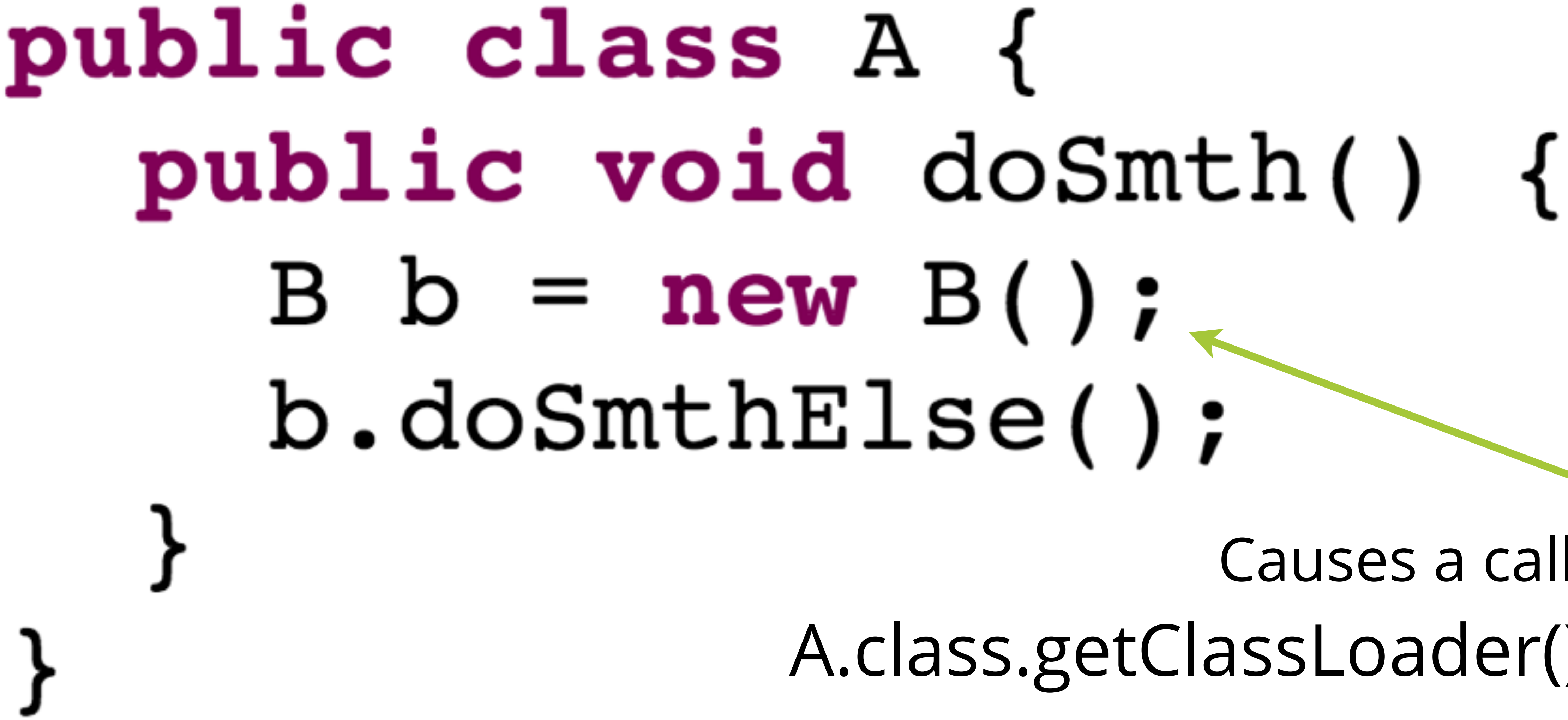
```
public abstract class ClassLoader {
  public Class loadClass(String name);
  protected Class defineClass(byte[] b);
  public URL getResource(String name);
  public Enumeration getResources(String name);
  public ClassLoader getParent()
};
```

EXAMPLE 0



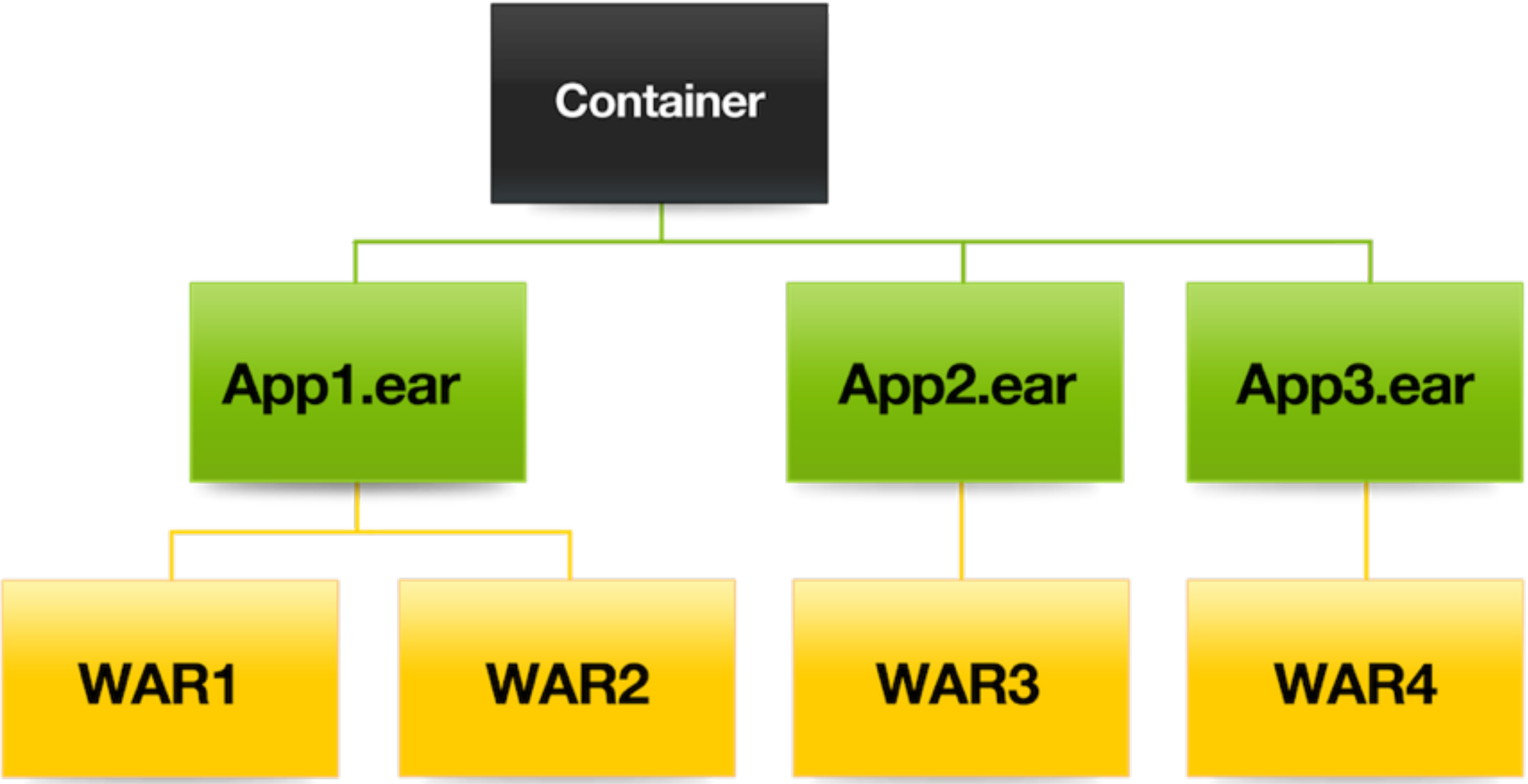
```
public class A {
  public void doSmth() {
    B b = new B();
    b.doSmthElse();
  }
}
```

EXAMPLE 0



```
public class A {
  public void doSmth() {
    B b = new B();
    b.doSmthElse();
  }
}
```

Causes a call to
A.class.getClassLoader().loadClass(“B”);



CL HIERARCHY

PROBLEMS

NOT ENOUGH CLASSES

- ClassNotFoundException
- NoClassDefFoundError

TROUBLESHOOTING

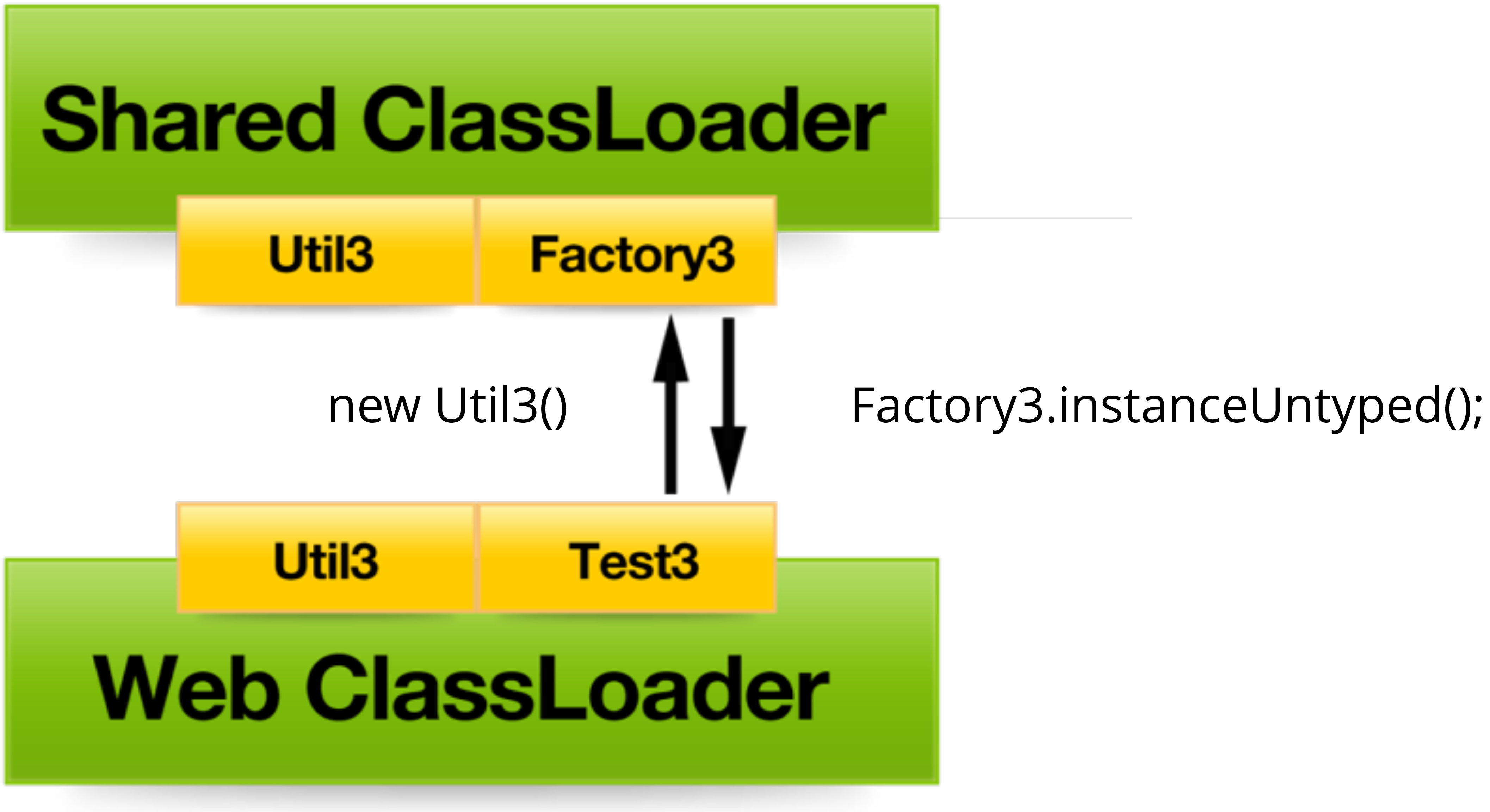
- IDE class lookup (Ctrl+Shift+T in Eclipse)
- find *.jar -exec jar -tf '{}' \; | grep MyClass
- URLClassLoader.getUrls()
- Container specific logs

STALE CLASSES

- IncompatibleClassChangeError
- AbstractMethodError
- NoSuch(Method|Field)FoundError
- ClassCastException, IllegalAccessError

TROUBLESHOOTING

- -verbose:class
- ClassLoader.getResource()
- javap -private MyClass



Shared ClassLoader

Util3

Factory3

new Util3()

Factory3.instanceUntyped();

Util3

Test3

Web ClassLoader

```
Util3 u = (Util3) Factory3.instanceUntyped();
```

MORE **CLASSLOADERS**

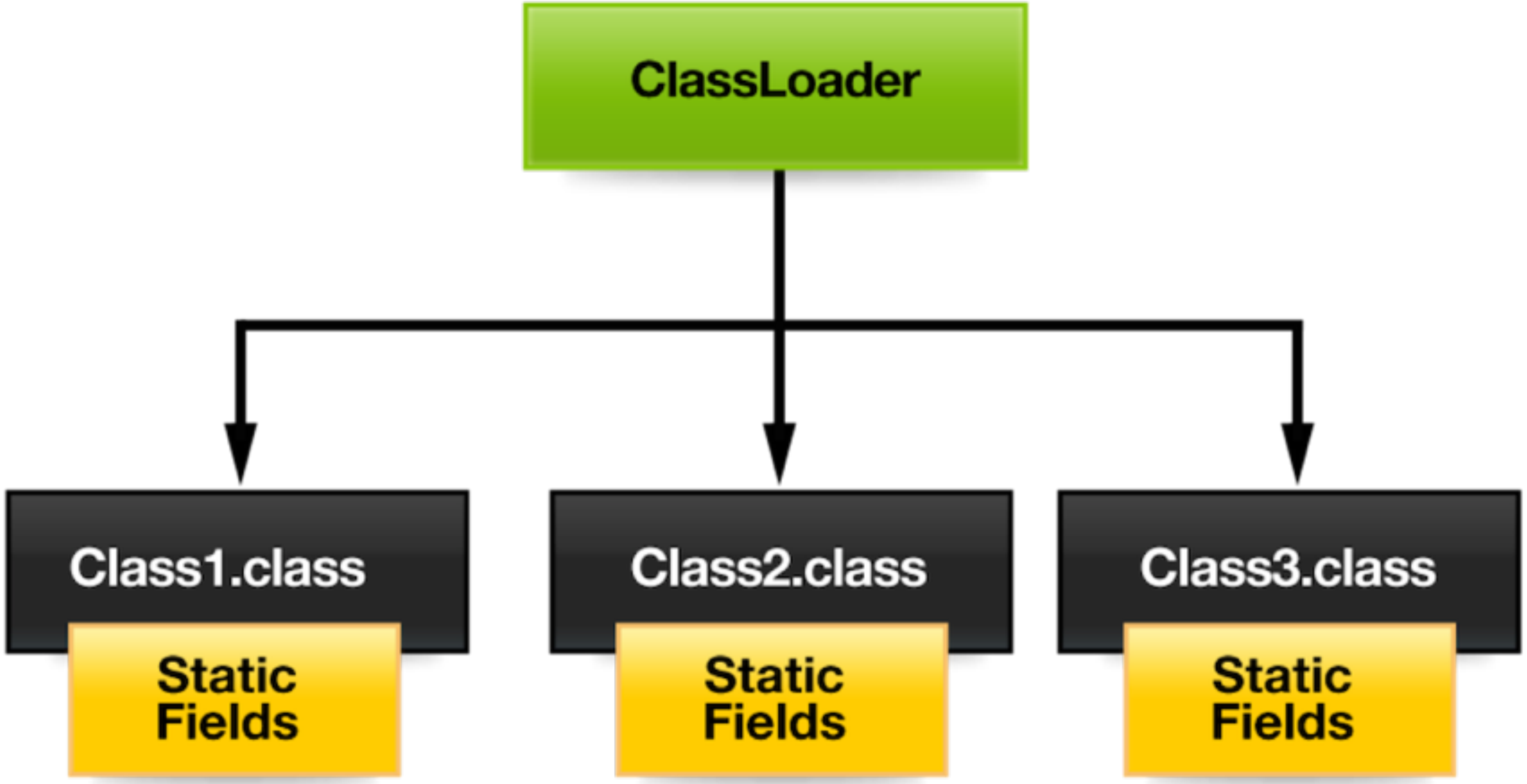
THAN **CLASSES**

- LinkageError (class loading constraints violated)
- ClassCastException, IllegalAccessError

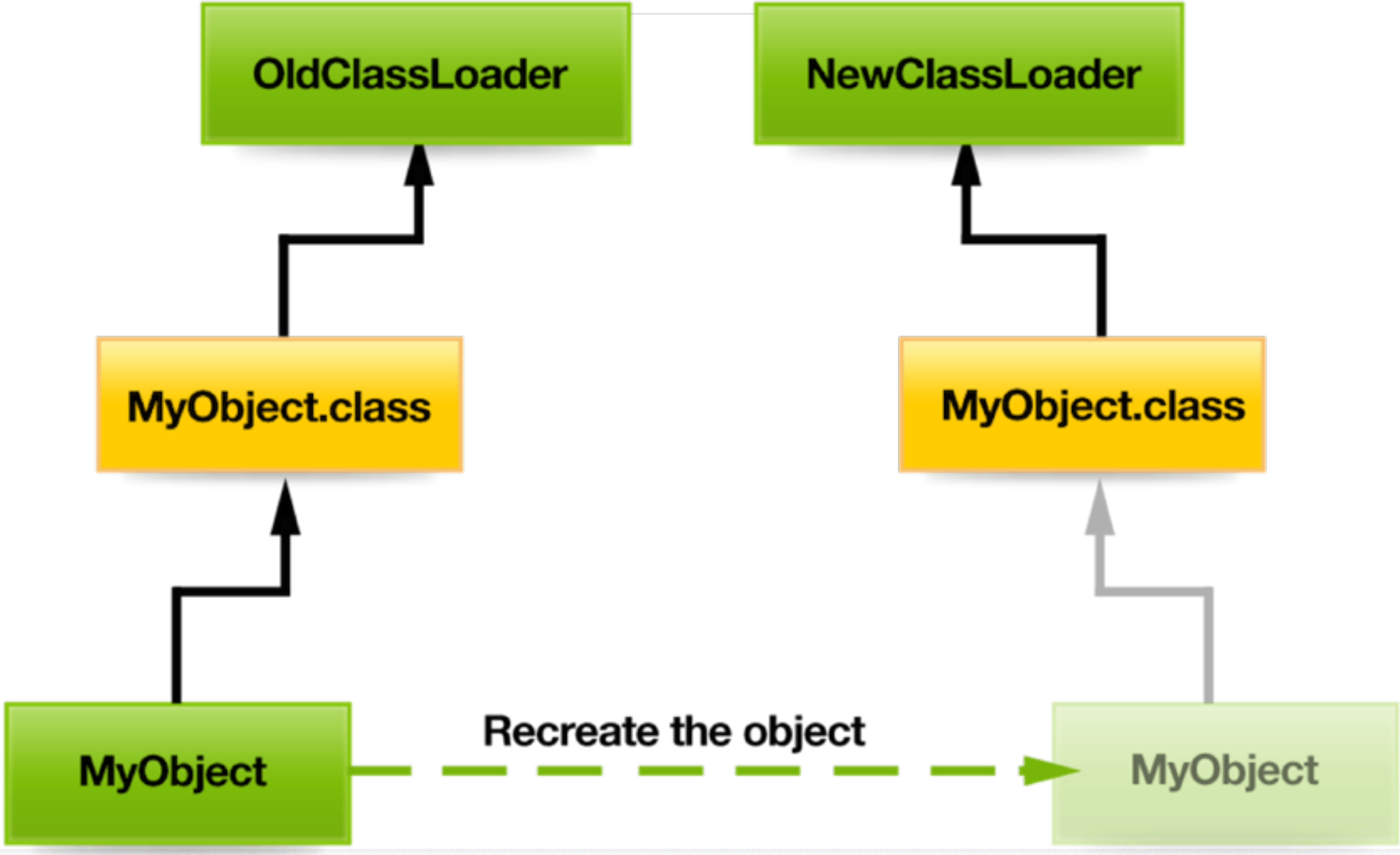
TROUBLESHOOTING

- -verbose:class
- ClassLoader.getResource()

CLASSLOADER **LEAKS**



CLASSLOADER **LEAKS**



TAKEAWAY

- Validate assumptions
- Leaking ClassLoaders is easy to do
- Isolation works for processes
- **JREBEL** rocks!

QUESTIONS!

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