

Class Loader

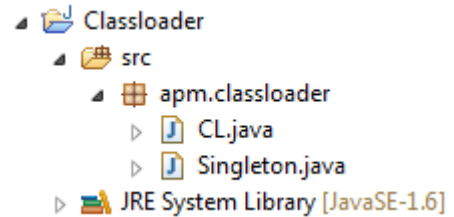
Unter ...finden Sie die Datei apm.classloader.zip, die ein kleines Eclipseprojekt enthält. Importieren Sie dieses Projekt in ihren Workspace. Das Projekt umfasst zwei Klassen:

Die Klasse Singleton enthält, was ihr Name verspricht:

```
public class Singleton {
    private static Singleton instance =
        new Singleton();

    private Singleton() {
        System.out.println("Singleton instance initialized!");
    }

    public static Singleton getInstance() {
        return instance;
    }
}
```



Die Klasse CL versucht nun zwei Mal diese Singleton-Klasse zu laden. Dabei wird ein URL-Classloader eingesetzt um die Klassen von einer beliebigen Stelle auf der Festplatte zu laden. In unserem Fall das Root-Verzeichnis:

```
public class CL {
    static void newClass(String path, String classname) throws Exception {
        URL url = new File(path).toURI().toURL();
        URLClassLoader cl = new URLClassLoader(new URL[] {url});
        cl.loadClass(classname);
    }

    public static void main(String[] args) throws Exception {
        newClass("/", "apm.classloader.Singleton");
        newClass("/", "apm.classloader.Singleton");
        System.out.println("done");
    }
}
```

newClass erzeugt jedes Mal einen neuen Classloader, so dass beim zweiten Mal also ein neuer Classloader die Singleton-Klasse neu laden sollte.

Aufgabe

- Passiert was Sie erwarten, nämlich dass die Klasse zwei Mal geladen wird? Warum (nicht)?
- Bringen Sie den Code zum Laufen. Die Meldung „Singleton instance initialized“ soll zwei Mal auf der Konsole erscheinen.

Hinweise

- Es ist notwendig, dass die Datei Singleton.class im Verzeichnis /apm/classloader existiert. Falls Sie nicht unter das Root-Verzeichnis Ihres Rechners deployen wollen, dann geben Sie im ersten Argument von newClass einen entsprechenden Pfad an.
- Starten Sie CL.main von der Konsole. Gehen Sie dazu ins bin-Verzeichnis des Projektes und geben Sie `java -cp . apm.classloader.CL` zum Starten ein.
- Überlegen Sie, in welcher Reihenfolge, welche Classloader zum Zuge kommen.
- Studieren Sie die API-Doku. Was macht loadClass genau?
- Starten Sie die JVM mit der Option `-verbose:class` um jede geladene Klasse in der Konsole angezeigt zu kriegen.

Lösung:

Folgende Punkte gilt es zu beachten:

- Die Klasse wird nur geladen, aber nicht initialisiert. Dies passiert erst, wenn auch tatsächlich Code der Klasse zur Ausführung gebracht wird. Daher ist es nötig, nach dem Befehl die Klasse zu laden...

```
cl.loadClass(classname);
```

...auch noch eine Methode aufzurufen:

```
Method m = c.getDeclaredMethod("getInstance", new Class<?>[] {});
m.invoke(null, (Object[])null);
```

- Die ganze Methode newClass sieht dann so aus:

```
static void newClass(String path, String classname) throws Exception {
    URL url = new File(path).toURI().toURL();
    URLClassLoader cl = new URLClassLoader(new URL[] {url});
    Class<?> c = cl.loadClass(classname);
    Method m = c.getDeclaredMethod("getInstance", new Class<?>[] {});
    m.invoke(null, (Object[])null);
}
```

- Falls "Singleton instance initialized!" nur einmal auf der Konsole erscheint, dann wurde das File Singleton.class welches der Compiler direkt neben das File CL.class geschrieben hat, nicht gelöscht. Existiert dieses File noch, dann befindet es sich nämlich auch im Classpath und wird somit vom System-Classloader schon gefunden und geladen!

- Hinweis zum Start aus der Konsole. Falls Sie folgendes eingetippt haben :

```
java apm.classloader.CL -verbose:class
```

und keine ausführlichen Informationen zu den Klassen erhalten haben, dann probieren Sie es doch mit:

```
java -verbose:class apm.classloader.CL
```

Der Unterschied? Im ersten Fall wird die Option `-verbose:class` als `arg[0]` der `main`-Methode von `CL` übergeben, im zweiten Fall wird die Option der JVM übergeben. **Beachte:** die JVM-Optionen müssen immer unmittelbar hinter dem Befehl `java` stehen und **vor** der Main-Klasse. Alles was hinter der Main-Klasse steht, wird als Argument der `main`-Methode übergeben.

Der Output sieht dann ungefähr so aus, ganz schön viele Klassen für so wenig Code ☺:

```
C:\Users\Christoph\FHNW\Semester\FS2014\apm\workspace\ClassLoader\bin>java -verbose:class apm.classloader.CL
[Loaded java.lang.Object from shared objects file]
[Loaded java.io.Serializable from shared objects file]
[Loaded java.lang.Comparable from shared objects file]
[Loaded java.lang.CharSequence from shared objects file]
[Loaded java.lang.String from shared objects file]
[Loaded java.lang.reflect.GenericDeclaration from shared objects file]
[Loaded java.lang.reflect.Type from shared objects file]
[Loaded java.lang.reflect.AnnotatedElement from shared objects file]
[Loaded java.lang.Class from shared objects file]
[Loaded java.lang.Cloneable from shared objects file]
[Loaded java.lang.ClassLoader from shared objects file]
[Loaded java.lang.System from shared objects file]
[Loaded java.lang.Throwable from shared objects file]
[Loaded java.lang.Error from shared objects file]
[Loaded java.lang.ThreadDeath from shared objects file]
[Loaded java.lang.Exception from shared objects file]
[Loaded java.lang.RuntimeException from shared objects file]
[Loaded java.security.ProtectionDomain from shared objects file]
[Loaded java.security.AccessControlContext from shared objects file]
[Loaded java.lang.ClassNotFoundException from shared objects file]
[Loaded java.lang.LinkageError from shared objects file]
[Loaded java.lang.NoClassDefFoundError from shared objects file]
[Loaded java.lang.ClassCastException from shared objects file]
[Loaded java.lang.ArrayStoreException from shared objects file]
[Loaded java.lang.VirtualMachineError from shared objects file]
```

[Loaded java.lang.OutOfMemoryError from shared objects file]
[Loaded java.lang.StackOverflowError from shared objects file]
[Loaded java.lang.IllegalMonitorStateException from shared objects file]
[Loaded java.lang.ref.Reference from shared objects file]
[Loaded java.lang.ref.SoftReference from shared objects file]
[Loaded java.lang.ref.WeakReference from shared objects file]
[Loaded java.lang.ref.FinalReference from shared objects file]
[Loaded java.lang.ref.PhantomReference from shared objects file]
[Loaded java.lang.ref.Finalizer from shared objects file]
[Loaded java.lang.Runnable from shared objects file]
[Loaded java.lang.Thread from shared objects file]
[Loaded java.lang.Thread\$UncaughtExceptionHandler from shared objects file]
[Loaded java.lang.ThreadGroup from shared objects file]
[Loaded java.util.Dictionary from shared objects file]
[Loaded java.util.Map from shared objects file]
[Loaded java.util.Hashtable from shared objects file]
[Loaded java.util.Properties from shared objects file]
[Loaded java.lang.reflect.AccessibleObject from shared objects file]
[Loaded java.lang.reflect.Member from shared objects file]
[Loaded java.lang.reflect.Field from shared objects file]
[Loaded java.lang.reflect.Method from shared objects file]
[Loaded java.lang.reflect.Constructor from shared objects file]
[Loaded sun.reflect.MagicAccessorImpl from shared objects file]
[Loaded sun.reflect.MethodAccessor from shared objects file]
[Loaded sun.reflect.MethodAccessorImpl from shared objects file]
[Loaded sun.reflect.ConstructorAccessor from shared objects file]
[Loaded sun.reflect.ConstructorAccessorImpl from shared objects file]
[Loaded sun.reflect.DelegatingClassLoader from shared objects file]
[Loaded sun.reflect.ConstantPool from shared objects file]
[Loaded sun.reflect.FieldAccessor from shared objects file]
[Loaded sun.reflect.FieldAccessorImpl from shared objects file]
[Loaded sun.reflect.UnsafeFieldAccessorImpl from shared objects file]
[Loaded sun.reflect.UnsafeStaticFieldAccessorImpl from shared objects file]
[Loaded java.lang.Appendable from shared objects file]
[Loaded java.lang.AbstractStringBuilder from shared objects file]
[Loaded java.lang.StringBuffer from shared objects file]
[Loaded java.lang.StringBuilder from shared objects file]
[Loaded java.lang.StackTraceElement from shared objects file]
[Loaded java.nio.Buffer from shared objects file]
[Loaded sun.misc.AtomicLong from shared objects file]
[Loaded sun.misc.AtomicLongCSImpl from shared objects file]
[Loaded java.lang.Boolean from shared objects file]
[Loaded java.lang.Character from shared objects file]
[Loaded java.lang.Number from shared objects file]
[Loaded java.lang.Float from shared objects file]
[Loaded java.lang.Double from shared objects file]
[Loaded java.lang.Byte from shared objects file]
[Loaded java.lang.Short from shared objects file]
[Loaded java.lang.Integer from shared objects file]
[Loaded java.lang.Long from shared objects file]
[Loaded java.io.ObjectStreamField from shared objects file]
[Loaded java.util.Comparator from shared objects file]
[Loaded java.lang.String\$CaseInsensitiveComparator from shared objects file]
[Loaded java.security.Guard from shared objects file]
[Loaded java.security.Permission from shared objects file]
[Loaded java.security.BasicPermission from shared objects file]
[Loaded java.lang.RuntimePermission from shared objects file]
[Loaded java.util.AbstractMap from shared objects file]
[Loaded sun.misc.SoftCache from shared objects file]
[Loaded java.lang.ref.ReferenceQueue from shared objects file]
[Loaded java.lang.ref.ReferenceQueue\$Null from shared objects file]
[Loaded java.lang.ref.ReferenceQueue\$Lock from shared objects file]
[Loaded java.util.HashMap from shared objects file]
[Loaded java.util.Map\$Entry from shared objects file]
[Loaded java.util.HashMap\$Entry from shared objects file]
[Loaded java.security.AccessController from shared objects file]
[Loaded java.lang.reflect.ReflectPermission from shared objects file]
[Loaded java.security.PrivilegedAction from shared objects file]
[Loaded sun.reflect.ReflectionFactory\$GetReflectionFactoryAction from shared objects file]
[Loaded java.lang.Iterable from shared objects file]
[Loaded java.util.Collection from shared objects file]
[Loaded java.util.AbstractCollection from shared objects file]
[Loaded java.util.List from shared objects file]
[Loaded java.util.AbstractList from shared objects file]
[Loaded java.util.RandomAccess from shared objects file]
[Loaded java.util.Vector from shared objects file]

[Loaded java.util.Stack from shared objects file]
[Loaded sun.reflect.ReflectionFactory from shared objects file]
[Loaded java.lang.ref.Reference\$Lock from shared objects file]
[Loaded java.lang.ref.Reference\$ReferenceHandler from shared objects file]
[Loaded java.lang.ref.Finalizer\$FinalizerThread from shared objects file]
[Loaded java.util.Enumeration from shared objects file]
[Loaded java.util.Hashtable\$EmptyEnumerator from shared objects file]
[Loaded java.util.Iterator from shared objects file]
[Loaded java.util.Hashtable\$EmptyIterator from shared objects file]
[Loaded java.util.Hashtable\$Entry from shared objects file]
[Loaded sun.misc.Version from shared objects file]
[Loaded sun.misc.JavaLangAccess from shared objects file]
[Loaded java.lang.System\$2 from shared objects file]
[Loaded sun.misc.SharedSecrets from shared objects file]
[Loaded sun.misc.Unsafe from shared objects file]
[Loaded java.lang.IncompatibleClassChangeError from shared objects file]
[Loaded java.lang.NoSuchMethodError from shared objects file]
[Loaded sun.reflect.Reflection from shared objects file]
[Loaded java.util.Collections from shared objects file]
[Loaded java.util.Set from shared objects file]
[Loaded java.util.AbstractSet from shared objects file]
[Loaded java.util.Collections\$EmptySet from shared objects file]
[Loaded java.util.Collections\$EmptyList from shared objects file]
[Loaded java.util.Collections\$EmptyMap from shared objects file]
[Loaded java.util.Collections\$ReverseComparator from shared objects file]
[Loaded java.util.Collections\$SynchronizedMap from shared objects file]
[Loaded sun.misc.VM from shared objects file]
[Loaded java.lang.Runtime from shared objects file]
[Loaded java.io.File from shared objects file]
[Loaded java.io.FileSystem from shared objects file]
[Loaded java.io.Win32FileSystem from shared objects file]
[Loaded java.io.WinNTFileSystem from shared objects file]
[Loaded java.io.ExpiringCache from shared objects file]
[Loaded java.util.LinkedHashMap from shared objects file]
[Loaded java.io.ExpiringCache\$1 from shared objects file]
[Loaded java.util.LinkedHashMap\$Entry from shared objects file]
[Loaded sun.security.action.GetPropertyAction from shared objects file]
[Loaded java.util.Arrays from shared objects file]
[Loaded java.lang.Math from shared objects file]
[Loaded sun.jkernel.DownloadManager from shared objects file]
[Loaded java.lang.ThreadLocal from shared objects file]
[Loaded sun.jkernel.DownloadManager\$1 from shared objects file]
[Loaded java.util.concurrent.atomic.AtomicInteger from shared objects file]
[Loaded java.lang.Class\$3 from shared objects file]
[Loaded java.lang.reflect.Modifier from shared objects file]
[Loaded sun.reflect.LangReflectAccess from shared objects file]
[Loaded java.lang.reflect.ReflectAccess from shared objects file]
[Loaded sun.jkernel.DownloadManager\$2 from shared objects file]
[Loaded java.lang.StringValue from shared objects file]
[Loaded java.lang.ClassLoader\$3 from shared objects file]
[Loaded java.io.ExpiringCache\$Entry from shared objects file]
[Loaded java.lang.ClassLoader\$NativeLibrary from shared objects file]
[Loaded java.io.Closeable from shared objects file]
[Loaded java.io.InputStream from shared objects file]
[Loaded java.io.FileInputStream from shared objects file]
[Loaded java.io.FileDescriptor from shared objects file]
[Loaded java.io.Flushable from shared objects file]
[Loaded java.io.OutputStream from shared objects file]
[Loaded java.io.FileOutputStream from shared objects file]
[Loaded java.io.FilterInputStream from shared objects file]
[Loaded java.io.BufferedInputStream from shared objects file]
[Loaded java.util.concurrent.atomic.AtomicReferenceFieldUpdater from shared objects file]
[Loaded java.util.concurrent.atomic.AtomicReferenceFieldUpdater\$AtomicReferenceFieldUpdaterImpl from shared objects file]
]
[Loaded sun.reflect.misc.ReflectUtil from shared objects file]
[Loaded java.io.FilterOutputStream from shared objects file]
[Loaded java.io.PrintStream from shared objects file]
[Loaded java.io.BufferedOutputStream from shared objects file]
[Loaded java.io.Writer from shared objects file]
[Loaded java.io.OutputStreamWriter from shared objects file]
[Loaded sun.nio.cs.StreamEncoder from shared objects file]
[Loaded java.nio.charset.Charset from shared objects file]
[Loaded java.nio.charset.spi.CharsetProvider from shared objects file]
[Loaded sun.nio.cs.FastCharsetProvider from shared objects file]
[Loaded sun.nio.cs.StandardCharsets from shared objects file]
[Loaded sun.util.PreHashMap from shared objects file]

[Loaded sun.nio.cs.StandardCharsets\$Aliases from shared objects file]
 [Loaded sun.nio.cs.StandardCharsets\$Classes from shared objects file]
 [Loaded sun.nio.cs.StandardCharsets\$Cache from shared objects file]
 [Loaded sun.nio.cs.HistoricallyNamedCharset from shared objects file]
 [Loaded sun.nio.cs.MS1252 from shared objects file]
 [Loaded java.lang.Class\$1 from shared objects file]
 [Loaded sun.reflect.ReflectionFactory\$1 from shared objects file]
 [Loaded sun.reflect.NativeConstructorAccessorImpl from shared objects file]
 [Loaded sun.reflect.DelegatingConstructorAccessorImpl from shared objects file]
 [Loaded java.nio.charset.CharsetEncoder from shared objects file]
 [Loaded sun.nio.cs.SingleByteEncoder from shared objects file]
 [Loaded sun.nio.cs.MS1252\$Encoder from shared objects file]
 [Loaded java.nio.charset.CodingErrorAction from shared objects file]
 [Loaded java.nio.charset.CharsetDecoder from shared objects file]
 [Loaded sun.nio.cs.SingleByteDecoder from shared objects file]
 [Loaded sun.nio.cs.MS1252\$Decoder from shared objects file]
 [Loaded java.nio.ByteBuffer from shared objects file]
 [Loaded java.nio.HeapByteBuffer from shared objects file]
 [Loaded java.nio.Bits from shared objects file]
 [Loaded java.nio.ByteOrder from shared objects file]
 [Loaded java.lang.Readable from shared objects file]
 [Loaded java.nio.CharBuffer from shared objects file]
 [Loaded java.nio.HeapCharBuffer from shared objects file]
 [Loaded java.nio.charset.CoderResult from shared objects file]
 [Loaded java.nio.charset.CoderResult\$Cache from shared objects file]
 [Loaded java.nio.charset.CoderResult\$1 from shared objects file]
 [Loaded java.nio.charset.CoderResult\$2 from shared objects file]
 [Loaded sun.nio.cs.Surrogate\$Parser from shared objects file]
 [Loaded sun.nio.cs.Surrogate from shared objects file]
 [Loaded java.io.BufferedWriter from shared objects file]
 [Loaded java.lang.Terminator from shared objects file]
 [Loaded sun.misc.SignalHandler from shared objects file]
 [Loaded java.lang.Terminator\$1 from shared objects file]
 [Loaded sun.misc.Signal from shared objects file]
 [Loaded sun.misc.NativeSignalHandler from shared objects file]
 [Loaded sun.misc.OSEnvironment from shared objects file]
 [Loaded sun.io.Win32ErrorMode from shared objects file]
 [Loaded java.lang.NullPointerException from shared objects file]
 [Loaded java.lang.ArithmeticException from shared objects file]
 [Loaded java.lang.Compiler from shared objects file]
 [Loaded java.lang.Compiler\$1 from shared objects file]
 [Loaded sun.misc.Launcher from shared objects file]
 [Loaded java.net.URLStreamHandlerFactory from shared objects file]
 [Loaded sun.misc.Launcher\$Factory from shared objects file]
 [Loaded java.security.SecureClassLoader from shared objects file]
 [Loaded java.net.URLClassLoader from shared objects file]
 [Loaded sun.misc.Launcher\$ExtClassLoader from shared objects file]
 [Loaded sun.security.util.Debug from shared objects file]
 [Loaded java.lang.Package from shared objects file]
 [Loaded java.net.URL from shared objects file]
 [Loaded java.security.CodeSource from shared objects file]
 [Loaded java.lang.Void from shared objects file]
 [Loaded java.security.cert.Certificate from shared objects file]
 [Loaded java.lang.ClassFormatError from shared objects file]
 [Loaded java.lang.IllegalArgumentException from shared objects file]
 [Loaded java.io.IOException from shared objects file]
 [Loaded sun.misc.URLClassPath from shared objects file]
 [Loaded java.lang.AssertionStatusDirectives from shared objects file]
 [Loaded sun.misc.JavaNetAccess from shared objects file]
 [Loaded java.net.URLClassLoader\$7 from shared objects file]
 [Loaded java.security.PermissionCollection from shared objects file]
 [Loaded java.util.StringTokenizer from shared objects file]
 [Loaded java.security.PrivilegedExceptionAction from shared objects file]
 [Loaded sun.misc.Launcher\$ExtClassLoader\$1 from shared objects file]
 [Loaded sun.misc.MetaIndex from shared objects file]
 [Loaded java.io.Reader from shared objects file]
 [Loaded java.io.BufferedReader from shared objects file]
 [Loaded java.io.InputStreamReader from shared objects file]
 [Loaded java.io.FileReader from shared objects file]
 [Loaded sun.nio.cs.StreamDecoder from shared objects file]
 [Loaded java.util.ArrayList from shared objects file]
 [Loaded java.lang.reflect.Array from shared objects file]
 [Loaded java.util.Locale from shared objects file]
 [Loaded java.util.concurrent.ConcurrentMap from shared objects file]
 [Loaded java.util.concurrent.ConcurrentHashMap from shared objects file]
 [Loaded java.util.concurrent.locks.Lock from shared objects file]

```
[Loaded java.util.concurrent.locks.ReentrantLock from shared objects file]
[Loaded java.util.concurrent.ConcurrentHashMap$Segment from shared objects file]
[Loaded java.util.concurrent.locks.AbstractOwnableSynchronizer from shared objects file]
[Loaded java.util.concurrent.locks.AbstractQueuedSynchronizer from shared objects file]
[Loaded java.util.concurrent.locks.ReentrantLock$Sync from shared objects file]
[Loaded java.util.concurrent.locks.ReentrantLock$NonfairSync from shared objects file]
[Loaded java.util.concurrent.locks.AbstractQueuedSynchronizer$Node from shared objects file]
[Loaded java.util.concurrent.ConcurrentHashMap$HashEntry from shared objects file]
[Loaded java.lang.CharacterDataLatin1 from shared objects file]
[Loaded java.io.ObjectStreamClass from shared objects file]
[Loaded sun.net.www.ParseUtil from shared objects file]
[Loaded java.util.BitSet from shared objects file]
[Loaded java.net.Parts from shared objects file]
[Loaded java.net.URLStreamHandler from shared objects file]
[Loaded sun.net.www.protocol.file.Handler from shared objects file]
[Loaded java.util.HashSet from shared objects file]
[Loaded sun.net.www.protocol.jar.Handler from shared objects file]
[Loaded sun.misc.Launcher$AppClassLoader from shared objects file]
[Loaded sun.misc.Launcher$AppClassLoader$1 from shared objects file]
[Loaded java.lang.SystemClassLoaderAction from shared objects file]
[Loaded java.lang.StringCoding from shared objects file]
[Loaded java.lang.ThreadLocal$ThreadLocalMap from shared objects file]
[Loaded java.lang.ThreadLocal$ThreadLocalMap$Entry from shared objects file]
[Loaded java.lang.StringCoding$StringDecoder from shared objects file]
[Loaded java.net.URLClassLoader$1 from shared objects file]
[Loaded sun.net.util.URLUtil from shared objects file]
[Loaded sun.misc.URLClassPath$3 from shared objects file]
[Loaded sun.misc.URLClassPath$Loader from shared objects file]
[Loaded sun.misc.URLClassPath$JarLoader from shared objects file]
[Loaded java.security.PrivilegedActionException from shared objects file]
[Loaded sun.misc.URLClassPath$FileLoader from shared objects file]
[Loaded sun.misc.Resource from shared objects file]
[Loaded sun.misc.URLClassPath$FileLoader$1 from shared objects file]
[Loaded sun.nio.ByteBuffered from shared objects file]
[Loaded java.security.Permissions from shared objects file]
[Loaded java.net.URLConnection from shared objects file]
[Loaded sun.net.www.URLConnection from shared objects file]
[Loaded sun.net.www.protocol.file.FileURLConnection from shared objects file]
[Loaded java.net.ContentHandler from shared objects file]
[Loaded java.net.UnknownContentHandler from shared objects file]
[Loaded sun.net.www.MessageHeader from shared objects file]
[Loaded java.io.FilePermission from shared objects file]
[Loaded java.io.FilePermission$1 from shared objects file]
[Loaded java.security.Policy from shared objects file]
[Loaded sun.security.provider.PolicyFile from shared objects file]
[Loaded java.security.Policy$UnsupportedEmptyCollection from shared objects file]
[Loaded java.io.FilePermissionCollection from shared objects file]
[Loaded java.security.AllPermission from shared objects file]
[Loaded java.security.UnresolvedPermission from shared objects file]
[Loaded java.security.BasicPermissionCollection from shared objects file]
[Opened C:\Program Files\Java\jre6\lib\rt.jar]
[Loaded sun.misc.JavaSecurityProtectionDomainAccess from C:\Program Files\Java\jre6\lib\rt.jar]
[Loaded java.security.ProtectionDomain$2 from C:\Program Files\Java\jre6\lib\rt.jar]
[Loaded java.security.ProtectionDomain$Key from C:\Program Files\Java\jre6\lib\rt.jar]
[Loaded java.security.Principal from shared objects file]
[Loaded apm.classloader.CL from file:/C:/Users/Christoph/FHNW/Semester/FS2014/apm/workspace/Classloader/bin/]
[Loaded java.net.URI from shared objects file]
[Loaded java.net.URI$Parser from shared objects file]
[Loaded apm.classloader.Singleton from file:/C:/]
[Loaded sun.reflect.NativeMethodAccessorImpl from shared objects file]
[Loaded sun.reflect.DelegatingMethodAccessorImpl from shared objects file]
Singleton instance initialized!
[Loaded apm.classloader.Singleton from file:/C:/]
Singleton instance initialized!
done
[Loaded java.lang.Shutdown from shared objects file]
[Loaded java.lang.Shutdown$Lock from shared objects file]
```

C:\Users\Christoph\FHNW\Semester\FS2014\apm\workspace\Classloader\bin>java -verbose:class apm.classloader.CL