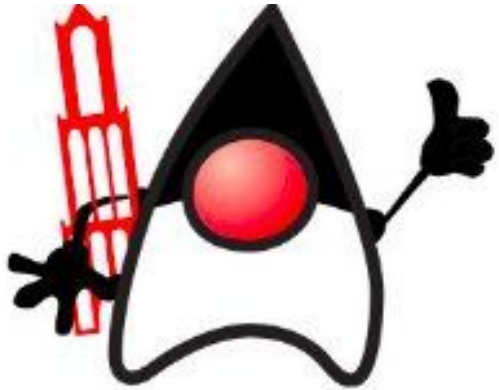


SECURING THE JVM

Neither for fun nor for profit, but do you have a choice?

EXOSCALE

@nicolas_frankel

ME, MYSELF AND I

- **Security-minded developer**
- **Developer advocate**

European alternative to the “big” cloud-computing players

- **Privacy-minded**
- **Great support**

WHO DOESN'T KNOW THAT TRICK?

```
public class Foo {

  private String hidden = "This should remain inaccessible!";
}

public class Oops {

  public static void main(String[] args)  throws Exception {
    Foo foo = new Foo();
    Class<? extends Foo> clazz = foo.getClass();
    Field field = clazz.getDeclaredField( "hidden");
    f
    Object hidden = field.get(foo);
    System.out.println(hidden);
  }
}
```

REFLECTION API

- **Part of the JRE**
  - `java.lang.reflect`

USED BY A LOT OF LANGUAGES/FRAMEWORKS

- **Dynamic languages**
  - Groovy
- **JPA frameworks**
  - Hibernate
  - Others
- **Spring**
- **Etc.**

YOU CAN DO PRETTY STUPID STUFF

```
public class Bar {

    private int hidden = 5;
}

public class OopsAgain {

  public static void main(String[] args) throws Exception {
    Bar bar = new Bar();
    Class<? extends Bar> clazz = bar.getClass();
    Field field = clazz.getDeclaredField("hidden");
    Field type = Field.class.getDeclaredField("type");
    AccessibleObject.setAccessible(
                        new AccessibleObject[] { field, type } , true);
    type.set(field, String.class);
    field.set(bar, "This should print 5!");
    Object hidden = field.get(bar);
    System.out.println(hidden);
  }
}
```

BUT EVERYTHING IS POSSIBLE

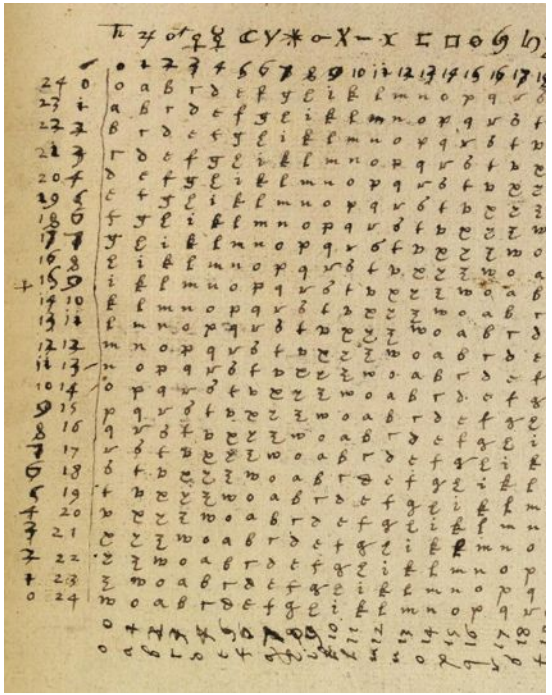
- Make networks calls
- Compile code on the fly
- Execute code
- Etc.

SAFEGUARDS?

- Static analyzers
- Byte-code analyzers
- Code reviews
- Security team
- Etc.

STEGANOGRAPHY

“Steganography is the practice of concealing a file, message, image, or video within another file, message, image, or video”



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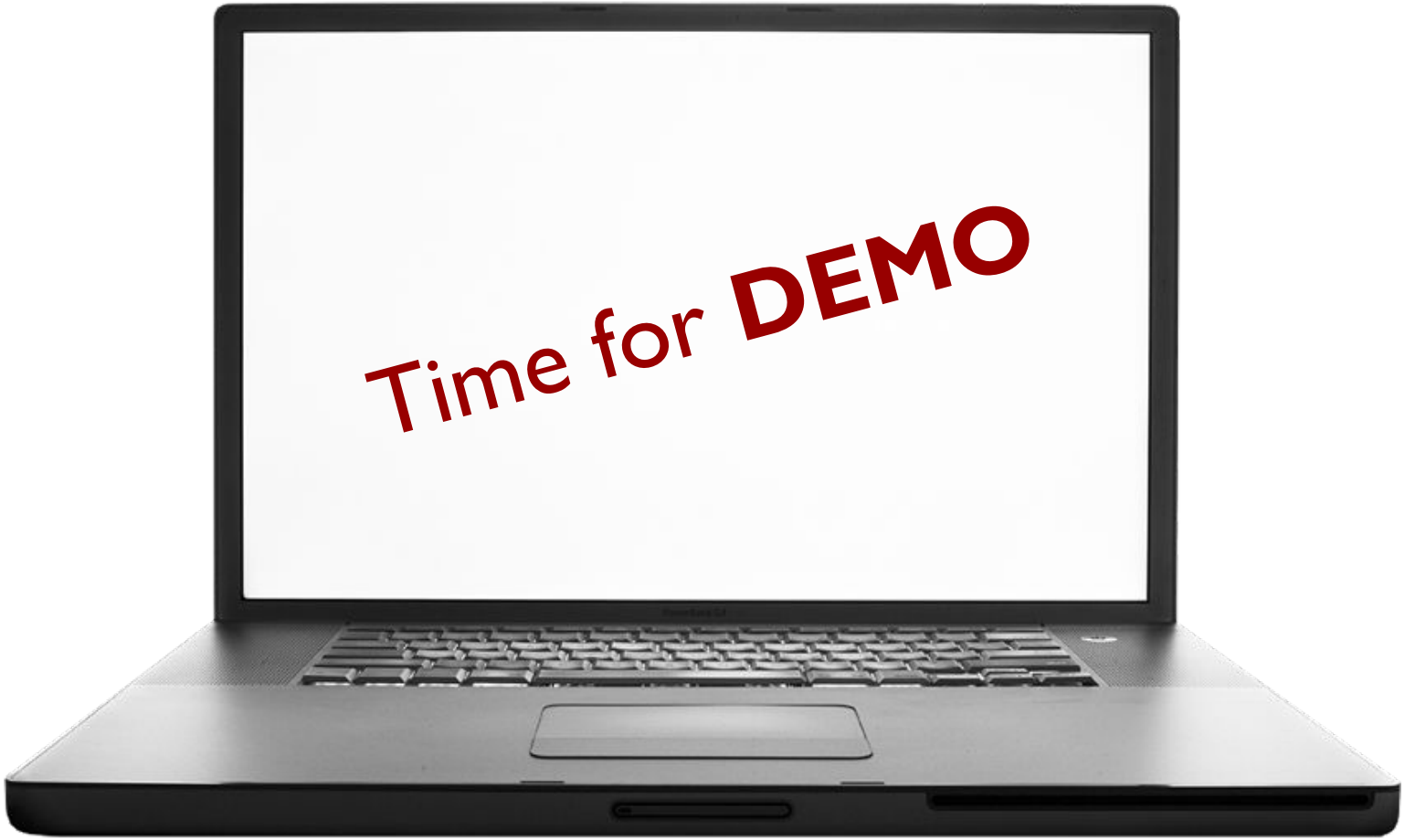
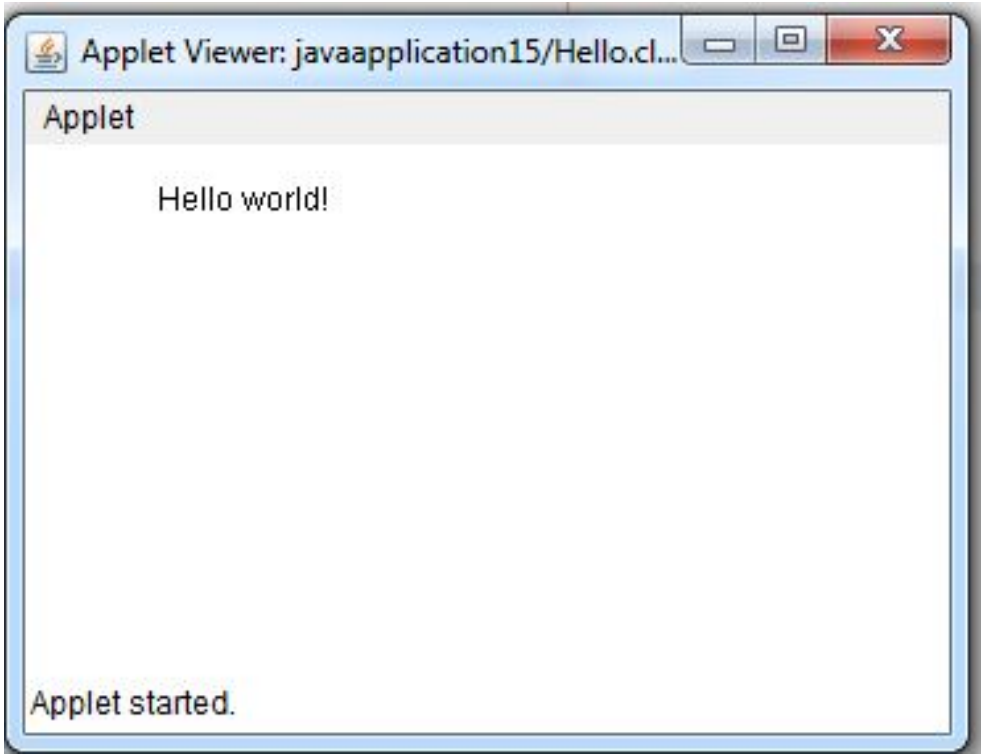

Time for DEMO

A SIMPLE PROCESS

1. **Publish a new library to central**
   - With hidden steganographic/compile/run features
2. **Add the library to your POM**
3. **Add an image with embedded code**
4. **Call the library**
   - Pretend to read the image
5. **Enjoy**

REMEMBER?


Applet Viewer: javaapplication15/Hello.cl...
Applet
Hello world!
Applet started.

APPLETS

- **Meant to run on the client machine**
  - Forbidden to do “dangerous” stuff
  - Run in a sandbox

AVAILABLE MODES

- **Standard mode**
  - a.k.a. “God Mode”
- **Sandbox mode**
  - Through a SecurityManager

ACTIVATING THE SECURITY MANAGER

- **On the command line**
  - `java -Djava.security.manager …`
- **Via the API**
  - `System.setSecurityManager()`

PERMISSIONS CONFIGURATION

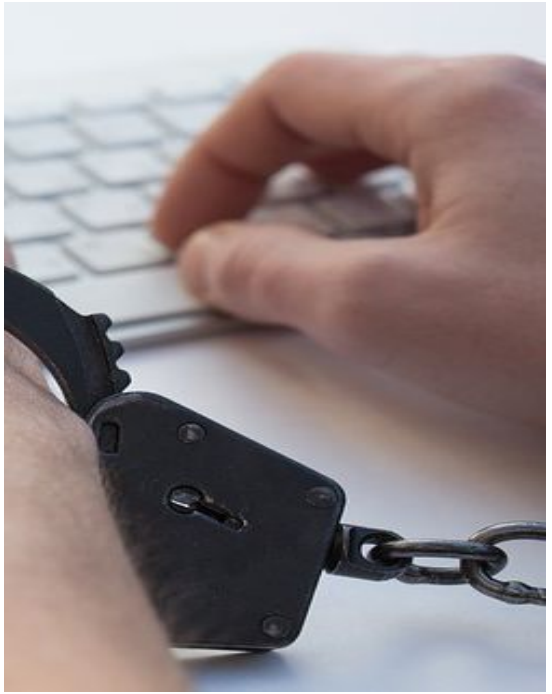
- **Java 9**
  - conf/security/java.security
  - ➔ conf/security/java.policy
- **Java 8**
  - jre/lib/security/java.security
  - ➔ jre/lib/security/java.policy

ALTERNATIVE POLICY FILE

- **Setting the policy file**
  - `-Djava.security.policy==my.policy`
- **Adding additional permissions**
  - `-Djava.security.policy=my.policy`

PRINCIPLE OF LEAST PRIVILEGE

“Requires that in a particular abstraction layer of a computing environment, every module must be able to access only the information and resources that are necessary for its legitimate purpose”



DEFAULT PERMISSIONS

- **Listen on ports**
- **Read a few System properties**

PERMISSIONS ARE ENFORCED IN THE JDK!

```
public class AccessibleObject
                    implements AnnotatedElement {
  public void setAccessible(boolean flag)
                        throws SecurityException {
    SecurityManager sm =
                    System.getSecurityManager();
    if (sm != null)
      sm.checkPermission(ACCESS_PERMISSION);
    setAccessible0(this, flag);
  }
}
```

PERMISSIONS

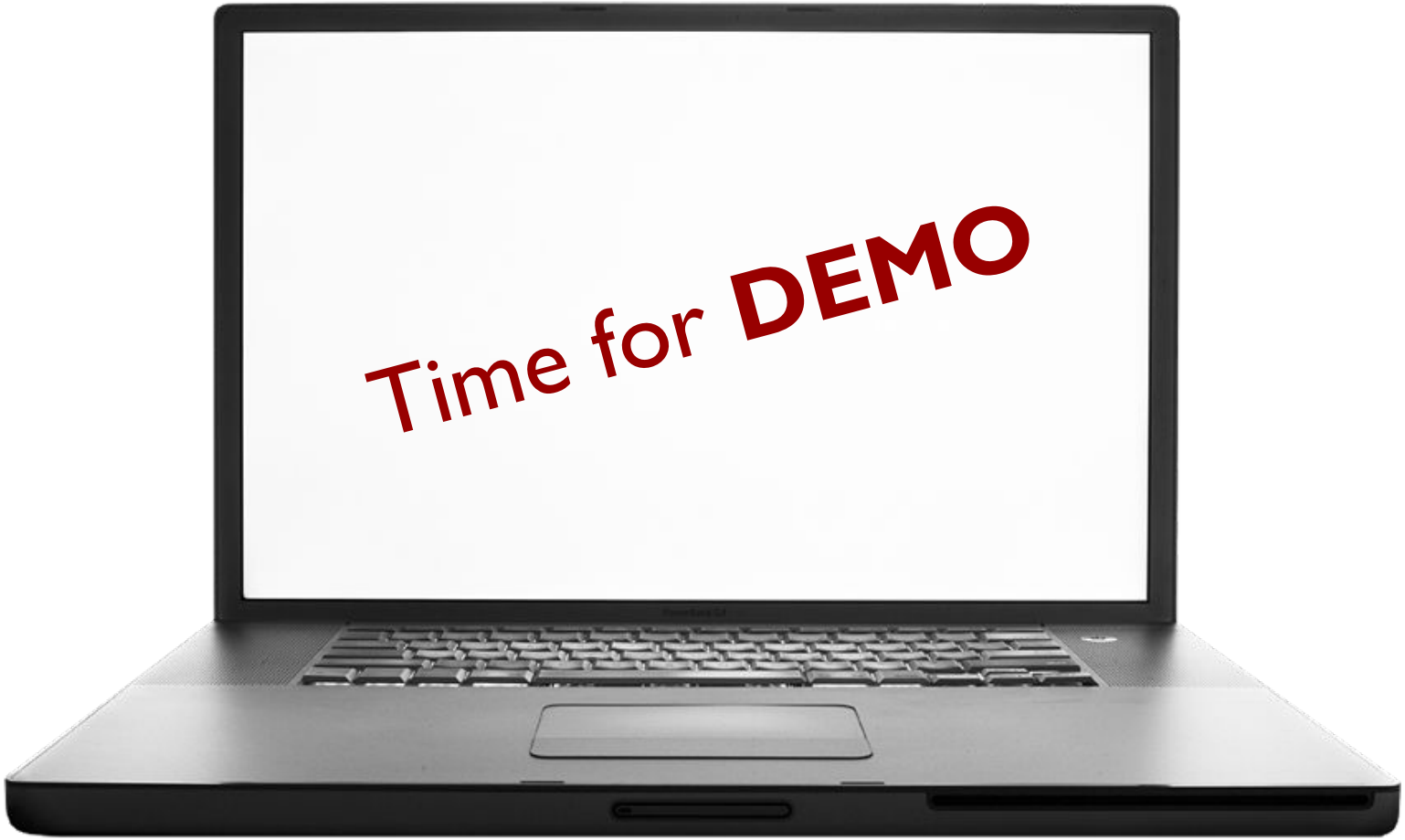
Permission	Details
AllPermission	☺
PropertyPermission	• Read • Write
FilePermission	• Read • Write • Execute • Delete
ReflectPermission	Suppress reflective access checks
RuntimePermission	• More granular reflective access checks • Security-related • Class-loading related • Exit Virtual Machine, shutdown hooks, etc.

PERMISSIONS (CONTINUED)

Permission	Details
SocketPermission	• accept • connect • listen • resolve
SSLPermission	• Get/set SSL context • Set hostname verifier
AuthPermission	
ServicePermission	Kerberos-related
AWTPermission	• Clipboard • Tray • Windows • Pointer • etc.

STRUCTURE OF A POLICY FILE (SIMPLIFIED)

```
grant codebase "file:myjar" {
  permission Foo "foo";
  permission Bar "bar", "baz";
};
```


Time for DEMO

THANKS!

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- https://git.io/fx54L

EXOSCALE

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