Tecnologia e Applicazioni Internet 2008/9

Lezione 3 - Servlets

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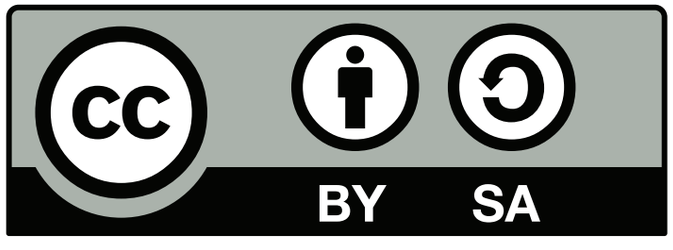
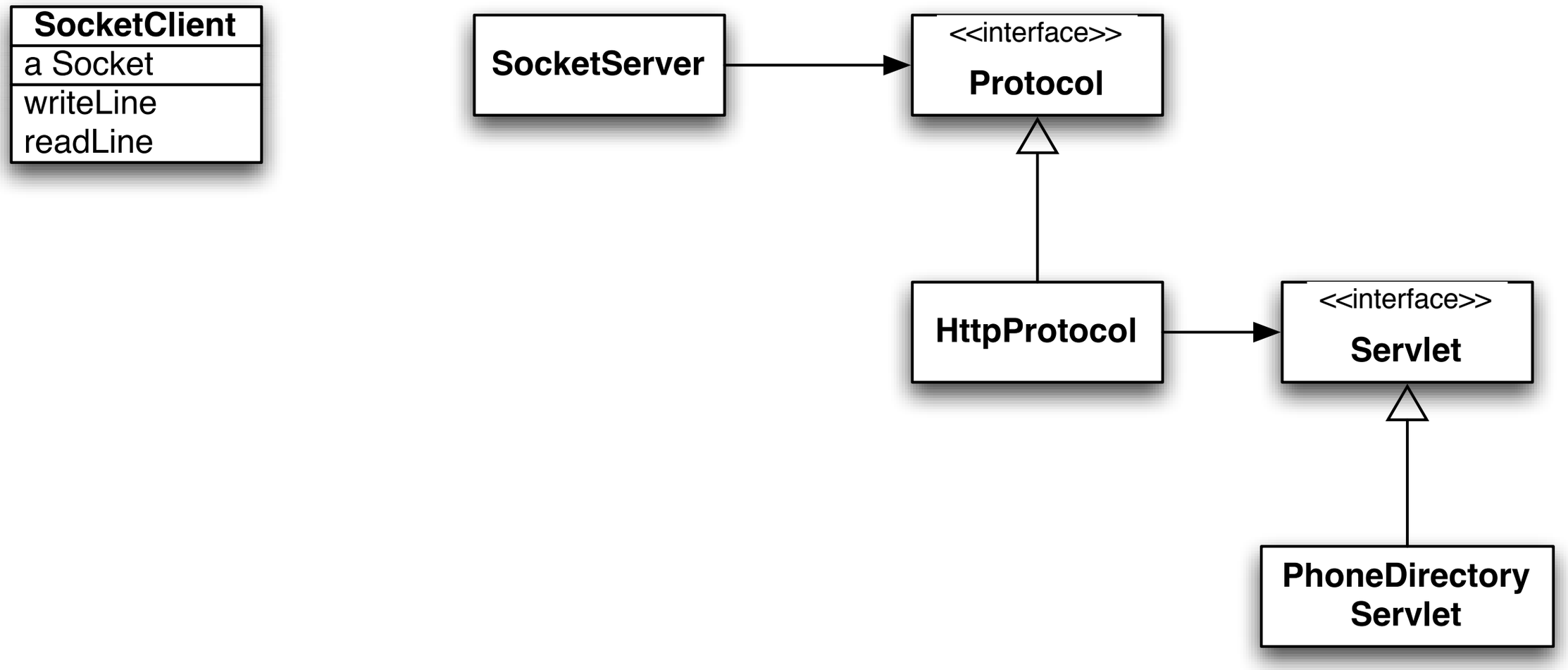


Le nostre “servlet”



Interface http/servlet

```
public void process(InputStream is, OutputStream os) throws IOException {

  BufferedReader reader = new BufferedReader(new InputStreamReader(is));
  PrintWriter writer = new PrintWriter(os);

  String path = parsePath(reader);
  String body = servlet.doGet(path);

  writer.print("HTTP/1.1 200 OK\r\n");
  writer.print("Content-Length: " + body.length() + "\r\n");
  writer.print("Content-Type: text/html\r\n");
  writer.print("\r\n");
  writer.print(body);
  writer.flush();
}
```

- Simplistic implementation
- Can’t do redirect
- Does not parse request parameters

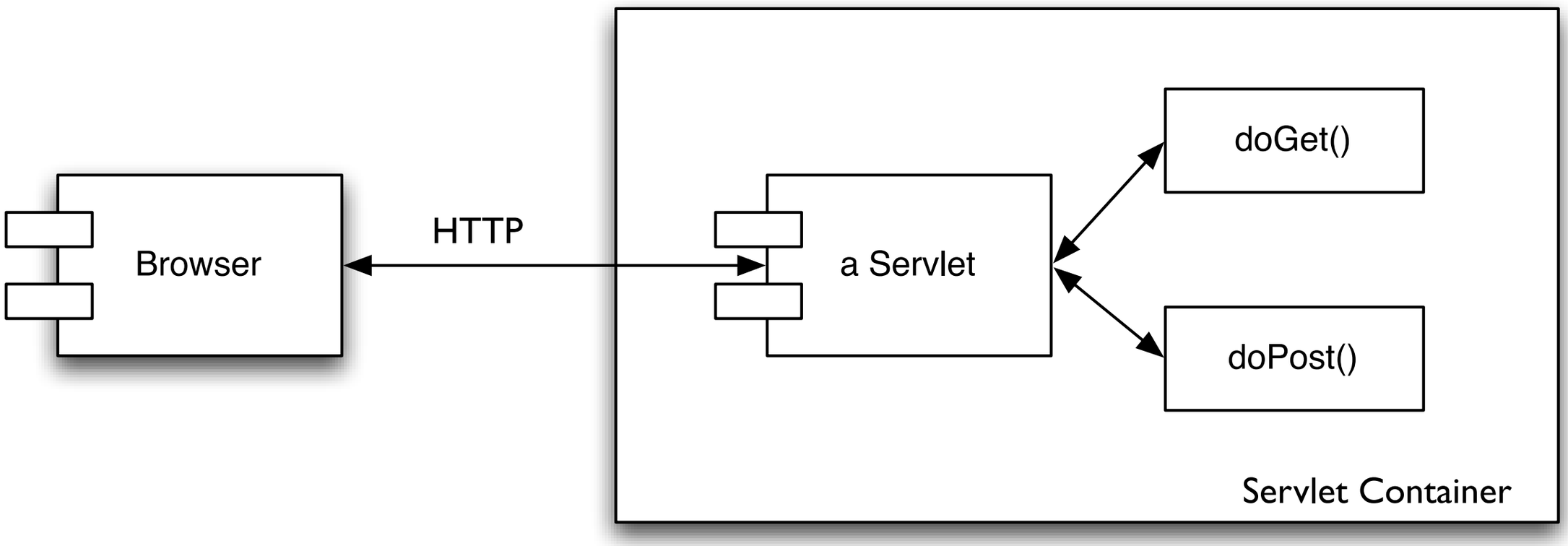
```
public void process(InputStream is, OutputStream os) throws IOException {

  BufferedReader reader = new BufferedReader(new InputStreamReader(is));

  HttpRequest request = new HttpRequest(reader);
  HttpResponse response = new HttpResponse();

  if ("POST".equals(request.getMethod())) {
    servlet.doPost(request, response);
  } else {
    servlet.doGet(request, response);
  }

  PrintWriter writer = new PrintWriter(os);
  writer.print("HTTP/1.1 " + response.status() + " OK\r\n");
  writer.print("Content-Length: " + response.length() + "\r\n");
  writer.print("Content-Type: " + response.contentType() + "\r\n");
  writer.print("\r\n");
  writer.print(response.body);
  writer.flush();
}
```

- More realistic implementation
- Servlets interact with complex *request* and *response* objects

```
POST /foobar HTTP/1.1
Host: localhost:4444
User-Agent: Mozilla/5.0

aaa=xxx&bbb=yyy
```

```java
@Test
public void testParsePost() throws Exception {
  String text = "POST /foobar HTTP/1.1\r\n"
    + "Host: localhost:4444\r\n"
    + "User-Agent: Mozilla/5.0\r\n"
    + "\r\n" + "aaa=xxx&bbb=yyy";
  Reader reader = new StringReader(text);
  HttpRequest request = new HttpRequest(reader);
  assertEquals("POST", request.getMethod());
  assertEquals("/foobar", request.getPath());
  assertEquals("localhost:4444", request.getHeader("host"));
  assertEquals("aaa=xxx&bbb=yyy", request.getBody());
  assertEquals("xxx", request.getParams().get("aaa"));
  assertEquals("yyy", request.getParams().get("bbb"));
  assertEquals(null, request.getParams().get("lkjhlkd"));
}
```

Servlets and container



Simple servlet

```
import java.io.*;
import javax.servlet.*;
import javax.servlet.http.*;

public class HelloWorld extends HttpServlet {

  public void doGet(HttpServletRequest request, HttpServletResponse response)
                                    throws ServletException, IOException {
    String name = request.getParameter("name");
    PrintWriter out = response.getWriter();

    out.println("<html>");
    out.println("<head><title>Hello world</title></head>");
    out.println("<body>");
    out.println("<big>Hello, " + name + "</big>");
    out.println("</body></html>");
  }
}
```

Project structure

```
.
|-- lib
|   `-- servlet-api-2.4.jar
|-- src
|   `-- com
|       `-- example
|           `-- foobar
|               `-- FoobarServlet.java
`-- webapp
    |-- WEB-INF
    |   |-- classes
    |   |   `-- com
    |   |       `-- example
    |   |           `-- foobar
    |   |               `-- FoobarServlet.class
    |   `-- web.xml
    |-- images
    |   `-- logo.png
    |-- index.html
    |-- javascripts
    |   `-- prototype.js
    `-- stylesheets
        `-- style.css
```

web.xml

```
<!DOCTYPE web-app
    PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.2//EN"
    "http://java.sun.com/j2ee/dtds/web-app_2_2.dtd">

<web-app>
    <servlet>
        <servlet-name>hello-world</servlet-name>
        <servlet-class>com.example.foobar.HelloWorld</servlet-class>
    </servlet>

    <servlet-mapping>
        <servlet-name>hello-world</servlet-name>
        <url-pattern>/hello/*</url-pattern>
    </servlet-mapping>
</web-app>
```

```
/           equivale a /*
/hello      path esatto
/hello/*    tutti i path con quel prefisso
*.png       tutti i path con quella estensione
```

Le servlet sono *singleton*

- Sono accedute da più thread contemporaneamente
- Evitare dunque le variabili di istanza

HttpServletRequest

http://www.example.com/context/hello/world

```
String getParameter(String)
Enumeration getParameterNames()

String getScheme()        //=> http
String getServerName()    //=> www.example.com
getServerPort()           //=> 80
getRequestURI()           //=> /context/hello/world
getContextPath()          //=> /context
getServletPath()          //=> /hello
getPathInfo()             //=> /world

String getRemoteAddr()
String getRemoteHost()

Enumeration getHeaderNames()
String getHeader(String name)

Cookie[] getCookies()
```

HttpServletResponse

```
void setContentType(String type)
void setContentLength(int length)
ServletOutputStream getOutputStream() // output binario
PrintWriter getWriter()               // output testo

void setHeader(String name, String val)
void addCookie(Cookie cookie)

void sendRedirect(String url)
void setStatus(int code)
```

Sessions

```
HttpSession session = request.getSession();
Integer userId = (Integer) session.getValue("userId");
```

Ant: like *make* for Java

```
<project name="simple-webapp" default="compile" basedir=".">

    <property name="build.dir"      location="target" />
    <property name="build.prod.dir" location="${build.dir}/prod"/>
    <property name="build.test.dir" location="${build.dir}/test"/>
    <property name="src.dir"        location="src"/>
    <property name="lib.dir"        location="lib" />
    <property name="web.dir"        location="webapp" />
    <property name="test.dir"       location="unit"/>
    <property name="test.lib.dir"   location="lib/test" />
    <property name="war.file"       location="${build.dir}/simple-webapp.war"/>
    <property name="conf.dir"       location="conf" />
```

Ant: like *make* for Java

```
<path id="project.classpath">
    <pathelement location="${build.prod.dir}" />
    <pathelement location="${build.test.dir}" />
    <fileset dir="${lib.dir}">
        <include name="**/*.jar"/>
    </fileset>
</path>

<target name="prepare">
    <mkdir dir="${build.prod.dir}"/>
    <mkdir dir="${build.test.dir}"/>
</target>

<target name="compile" depends="prepare">
    <javac source="1.5" target="1.5" destdir="${build.prod.dir}"
           debug="true" encoding="utf-8">
        <src path="${src.dir}" />
        <classpath refid="project.classpath" />
    </javac>
</target>
```

Ant: like *make* for Java

```
<target name="prepare">
    <mkdir dir="${build.prod.dir}"/>
    <mkdir dir="${build.test.dir}"/>
</target>

<target name="compile" depends="prepare">
    <javac source="1.5" target="1.5" destdir="${build.prod.dir}"
           debug="true" encoding="utf-8">
        <src path="${src.dir}" />
        <classpath refid="project.classpath" />
    </javac>
</target>
```

```
$ ant compile
Buildfile: build.xml

prepare:
    [mkdir] Created dir: /.../target/prod
    [mkdir] Created dir: /.../target/test

compile:
    [javac] Compiling 3 source files to /.../target/prod

BUILD SUCCESSFUL
Total time: 0 seconds
$
```

Web ARchives: .war

```
$ jar tf target/simple-webapp.war
META-INF/
META-INF/MANIFEST.MF
WEB-INF/
WEB-INF/web.xml
WEB-INF/classes/
WEB-INF/classes/com/
WEB-INF/classes/com/example/
WEB-INF/classes/com/example/foobar/
WEB-INF/classes/com/example/foobar/HelloServlet.class
images/
javascripts/
stylesheets/
images/logo.png
javascripts/prototype.js
stylesheets/style.css
$
```

```
<target name="war" depends="compile">
    <war destfile="${war.file}" webxml="${conf.dir}/web.xml">
        <classes dir="${build.prod.dir}" />
        <classes dir="${src.dir}" includes="**/*.properties" />
        <fileset dir="${web.dir}" />
        <classes dir="${conf.dir}" includes="log4j.*" />
    </war>
</target>
```

```
$ ant war
Buildfile: build.xml

prepare:

compile:
    [javac] Compiling 2 source files to /.../target/prod

war:
      [war] Building war: /.../target/simple-webapp.war

BUILD SUCCESSFUL
Total time: 0 seconds
$
```

Running a .war

```
$ cat script/start.sh

ant clean war || exit 1
java -jar script/winstone-0.9.10.jar --warfile target/simple-webapp.war

$
```

Winstone is a very easy-to-use servlet container

Servlets are hard to test

- Require to extend HttpServlet
- Require a no-arguments constructor
- Work with HttpServletRequest and -Response which are hard to instantiate
  - HttpServletRequest: interface with 54 methods
  - HttpServletResponse: interface with 32 methods

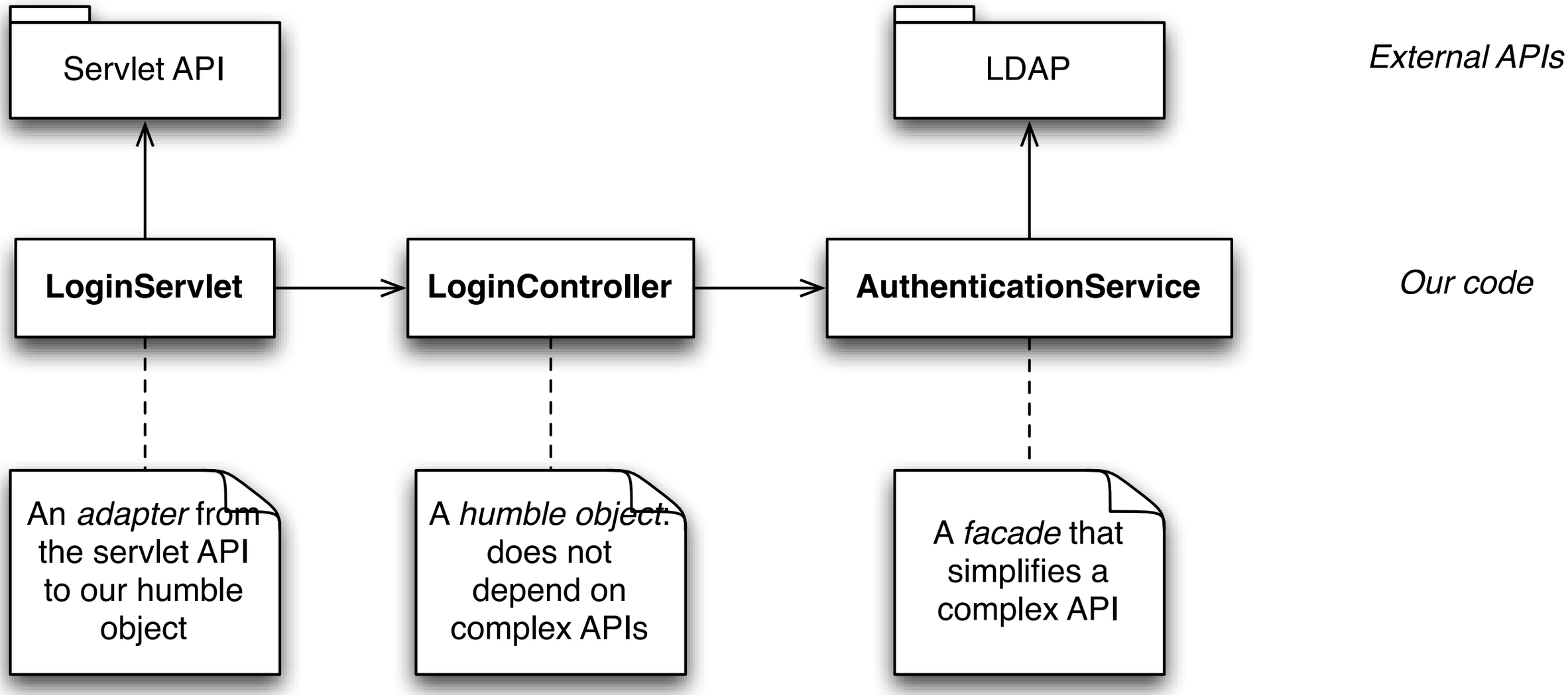
What are test doubles?

- Stub: an object that implements a simplified version of the real object
- Mock: an object that verifies interaction

Testing a servlet with stubs

```
import com.mockobjects.servlet.MockHttpServletRequest;
import com.mockobjects.servlet.MockHttpServletResponse;

public class AdderServletTest {

  @Test
  public void testAddingTwoNumbers() throws Exception {
    MockHttpServletRequest request = new MockHttpServletRequest();
    request.setupAddParameter("a", "3");
    request.setupAddParameter("b", "2");
    MockHttpServletResponse response = new MockHttpServletResponse();
    response.setExpectedContentType("text/plain");

    new AdderServlet().doGet(request, response);

    assertEquals("5\n", response.getOutputStreamContents());
    response.verify();
  }
}
```

Testing with humble objects



Simplify complex APIs with a *facade*

```
interface AuthenticationService {
  boolean authenticate(String username,
                       String password);
}

class LdapAuthenticationService implements AuthenticationService {
  boolean authenticate(String username,
                       String password) {
    // do complex stuff
  }
}

class StubAuthenticationService implements AuthenticationService {
  boolean authenticate(String username,
                       String password) {
    return username.equals("foo") && password.equals("bar");
  }
}
```

Testing with *humble objects*

```
class LoginController {
  AuthenticationService authenticator;
  boolean success;
  String errorMessage;

  LoginController(AuthenticationService authenticator) {
    this.authenticator = authenticator;
  }

  String execute(Map<String, String> parameters,
                 String cookie) {
    // do some work
    success = ...;
    errorMessage = ...;
  }

  String render(Writer writer) {
    if (success)
      return "redirect URL";
    else
      writer.write(...);
  }
}
```

http://misko.hevery.com/2009/01/04/interfacing-with-hard-to-test-third-party-code/

An *adapter* from Servlet

```
class LoginServlet extends HttpServlet {
  Provider<LoginController> provider;

  // no arg constructor required by Servlet Framework
  LoginServlet() {
    this(Global.injector.getProvider(LoginController.class));
  }

  // Dependency injected constructor used for testing
  LoginServlet(Provider<LoginController> provider) {
    this.provider = provider;
  }

  void doPost(HttpServletRequest req, HttpServletResponse resp) {
    LoginController controller = provider.get();
    controller.execute(req.getParameterMap(), req.getCookies());
    String redirect = controller.render(resp.getWriter())
    if (redirect != null)
      resp.sendRedirect(redirect);
  }
}
```

http://misko.hevery.com/2009/01/04/interfacing-with-hard-to-test-third-party-code/

Key points

- *Facade* is used when we are calling a complex API
- *Adapter* is used when *we are called* by a complex API
- Humble objects contain application logic & are easy to test
- Adapter is hard to test but contains *no logic, only wiring*
- Facades can be interfaces that are easy to stub