



Intrusive unit testing for Web applications

Philippe Poulard

► **To cite this version:**

Philippe Poulard. Intrusive unit testing for Web applications. WWW 2009: 18th international World Wide Web conference, Apr 2009, Madrid, Spain. <inria-00481893>

HAL Id: inria-00481893

<https://hal.inria.fr/inria-00481893>

Submitted on 7 May 2010

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

April 20-24,

WWW 2009
MADRID! SPAIN

Madrid, Spain

Intrusive unit testing for Web applications



Testing a Web application:

User operations:

- Get the welcome page
- Click on a link
- Fill a form
- Check the pages
- etc

Operations to perform by a robot:

- A robot can replay the tests
- A robot won't complain
- A robot doesn't make mistakes (except those of the test designer)
- So far, a robot can't check what really happened server-side, except by checking the response sent to the client

Features expected:

- Support of Javascript/AJAX
- Multiples windows/frames
- Forms, prompts, alerts
- etc

WUnit can!
(yes we can!)

- ✓ XML/XPath
 - Require basic XSLT knowledge
 - Lots of XML libraries already available
- ✗ Not designed for low-level tests
(does my Javascript/CSS hack works in IE and Firefox ?)
 - Use Selenium instead
- ✓ Tests-driven development
 - Write your tests BEFORE coding the Web app
- ✓ **Intrusive**: can act on server-side components
(user session, request, response, Web application, servlet)
 - AFAIK, no other tool can do that
 - Examine what happens in the server
 - Update server components, GET the page that render them
(REAL UNIT TEST)

▪ Non-intrusive mode

Start a conversation with a real server (Apache, Tomcat, PHP, etc):

```
<wunit:conversation>
  <!--your tests here-->
</wunit:conversation>
```

Wunit gives you the control of the Web client

▪ Intrusive mode

Start a conversation with an emulator (servlets only):

```
<wunit:conversation
  application="file:///path/to/webapps/hello/WEB-INF/web.xml"
  uri="http://www.example.com/">
  <!--your tests here-->
</wunit:conversation>
```

WUnit gives you the control of:

- the Web client
- the Web server (for the host specified in @uri)

- GET a page:

```
<wunit:GET url="http://www.example.com/index.html?who=John Doe"/>
```

- Click a link:

```
<wunit:click target="{ $wunit:document//A[@href][2] }"/>
```

- Fill a form:

```
<wunit:fill-form form="{ $wunit:document//FORM[@name='login'] }">  
  <xcl:param name="user" value="Bill"/>  
  <xcl:param name="password" value="Sesame"/>  
</wunit:fill-form>
```

- POST datas:

```
<wunit:POST url="http://www.example.com/login.html">  
  <xcl:param name="user" value="Bill"/>  
  <xcl:param name="password" value="Sesame"/>  
</wunit:POST>
```

- Check HTTP headers (and cookies):

```
<xunit:assert-number-equals expected="200"  
  result="{ value($wunit:frame/@wunit:response-code) }"/>  
<xunit:assert-string-equals expected="text/html"  
  result="{ string($wunit:frame/@wunit:mime-type) }"/>
```

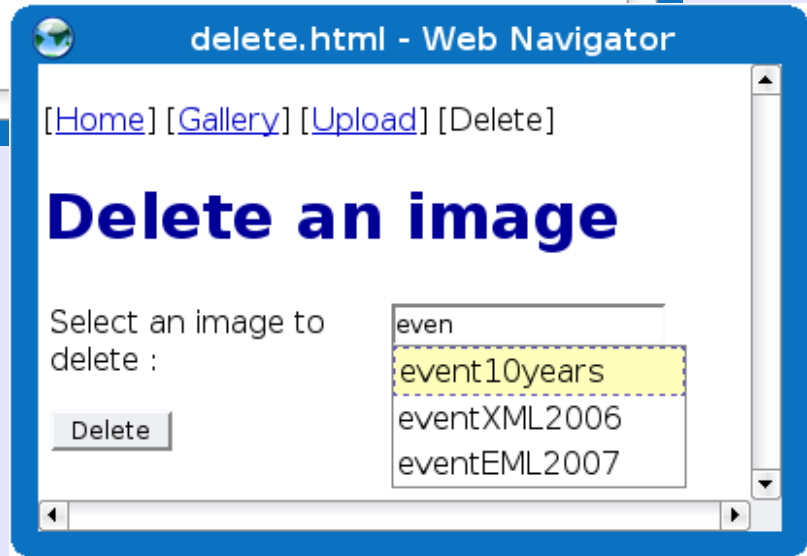
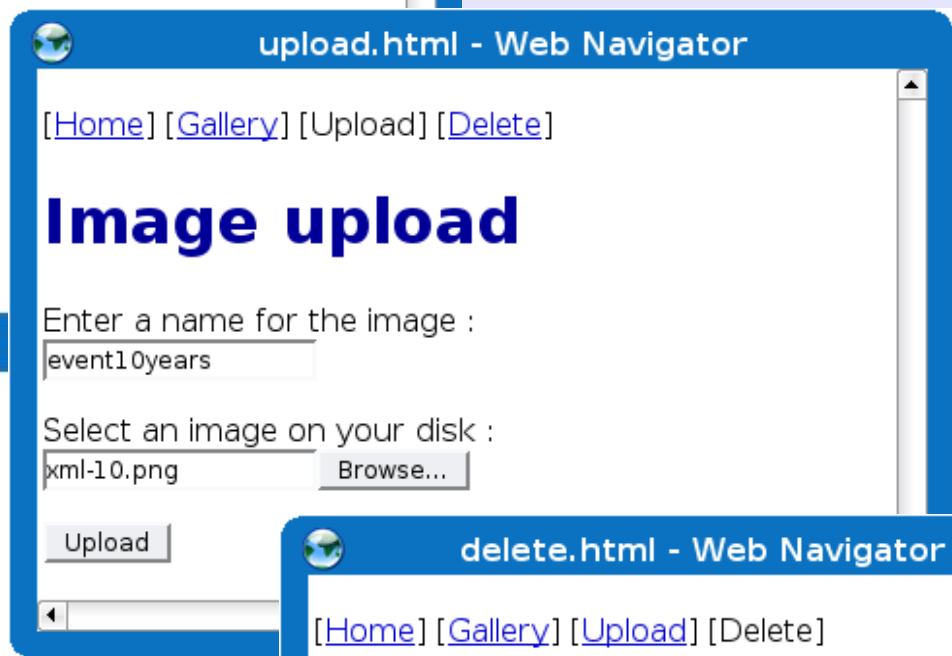
- **WUnit** is just a module (a library) from a larger framework called **Active Tags** that allows to design XML-based applications.
- **Reflex** is an implementation of **Active Tags** in Java.

Each module can define active tags `<my:elem>`, XPath functions `my:funct()`, XPath variables `$my:var`, foreign attributes `@my:attr`, data types `#my:data-types`

Tag libraries available (from Active Tags and Reflex):

- **WUnit**: `<wunit:GET>`, `<wunit:click>`, `$wunit:document`, etc
- **XUnit**: `<xunit:test-case>`, `<xunit:assert-node-equals>`, etc
- **XCL (the XML Control Language)**: `<xcl:if>`, `<xcl:then>`, `<xcl:else>`, `<xcl:parse>`, `<xcl:transform>` (XSLT), etc
- **I/O**: `io:file()`, `#io:input`, etc
- **Web**: `<web:mapping>`, `$web:session`, `#web:x-session`, `web:mime-type()`
- etc (SQL, XQuery...)

Hundreds of active materials are available



AJAX autocompleter


```

<!--set the boundary of the test case-->
<xunit:test-case name="report/1-gallery-welcome" label="[Web] Welcome page">
  <!--start to discuss with the servlet emulator-->
  <wunit:conversation application="../webapp/WEB-INF/web.xml"
    uri="http://www.example.com/">
    <!--get the welcome page hosted in our server emulator-->
    <wunit:GET url="http://www.example.com/">
    <!--do we have it ?
      we ask to the $wunit:frame predefined property
      what is the HTTP response code-->
    <xunit:assert-number-equals
      result="{ value( $wunit:frame/@wunit:response-code ) }"
      expected="200"/>
    <!--is it an HTML page ?-->
    <xunit:assert-string-equals
      result="{ string( $wunit:frame/@wunit:mime-type ) }"
      expected="text/html"/>
    <!--parse the static welcome page from the file system...-->
    <xcl:parse-html source="../webapp/index.html" name="expected"/>
    <!--...and compare it with those returned by the server.
      $wunit:document is a predefined property that refers to
      the DOM of the HTML document of the current page-->
    <xunit:assert-node-equals
      result="{ $wunit:document }"
      expected="{ $expected }"/>
  </wunit:conversation>
</xunit:test-case>

```

But, it is empty !?!

Yes, but let's store authoritatively some images in the user session (because this application works like this), and check how is rendered the page

```

<wunit:conversation application="../../webapp/WEB-INF/web.xml"
    uri="http://www.example.com/">
  <!--store directly some objects in the current session server-side
    (objects are stored as attributes) ;
    the objects stored are images from the file system-->
  <xcl:attribute referent="{ $wunit:session }"
    name="item1"
    value="{ io:file( '../img/xml-10.png' ) }"/>
  <xcl:attribute referent="{ $wunit:session }"
    name="item2"
    value="{ io:file( '../img/xml2006-logo.png' ) }"/>
  <!--get the gallery page-->
  <wunit:GET url="http://www.example.com/gallery.html"/>
  <!--check the result:
    .../...

-->

```

```
<!--  
        .../...  
-->  
<!--check what we GET:-->  
<xunit:assert-number-equals  
    result="{ value( $wunit:frame/@wunit:response-code ) }"  
    expected="200"/>  
<xunit:assert-string-equals  
    result="{ string( $wunit:frame/@wunit:mime-type ) }"  
    expected="text/html"/>  
<!--we should have 2 rows-->  
<xunit:assert-number-equals  
    result="{ count( $wunit:document//TR ) }"  
    expected="2"/>  
<!--first row-->  
<xunit:assert-string-equals  
    result="{ $wunit:document//TR[1]/TD[1] }"  
    expected="item1"/>  
<xunit:assert-string-equals  
    result="{ $wunit:document//TR[1]/TD[2]/IMG/@src }"  
    expected="images/item1"/>  
<!--second row-->  
<xunit:assert-string-equals  
    result="{ $wunit:document//TR[2]/TD[1] }"  
    expected="item2"/>  
<xunit:assert-string-equals  
    result="{ $wunit:document//TR[2]/TD[2]/IMG/@src }"  
    expected="images/item2"/>  
</wunit:conversation>
```

Upload a file and test if it's in the Web server

```
<!--fill the HTML form and POST it to the server-->
<wunit:fill-form form="{ $wunit:document//FORM[@name='upload'] }">
  <!--the text input is a string-->
  <xcl:param name="imageName" value="test1"/>
  <!--the file to upload, just give it a file-->
  <xcl:param name="imageFile" value="{ io:file( '../img/xml-10.png' ) }"/>
</wunit:fill-form>
<!--check the message in the
response page sent
by the server-->
<xunit:assert-string-equals
  result="{ normalize-space( $wunit:document//BODY/DIV[1] ) }"
  expected="xml-10.png uploaded."/>
<!--check that the session object was created ;
it contains a reference to a file stored in the server ;
we just check the name of the file-->
<xunit:assert-string-equals
  result="{ name( value( $wunit:session/@test1 ) ) }"
  expected="xml-10.png"/>
```

xml-10.png uploaded.

Other tests to consider:

- The AJAX autocompleter (please refer to the RefleX web site)
- A complete scenario (please refer to the RefleX web site)
- Checking database updates: this could be performed with a direct SQL or XQuery query to the database.

Tools for running all the test cases, aggregating the results in a single XML report, and an XSLT stylesheet are supplied

XUnit report - Web Navigator

XUnit report

Test name	Skip	Tests	Errors	Failure
Summary of Web-Gallery tests	0	7 (124)	2 (3)	0 (0)
1/7 [Web] Welcome page		79	0	0
2/7 [Web] Gallery page		10	0	0
				[Display sysout]
3/7 [Web] Upload page		4	0	0
				[Display sysout]
4/7 [Web] Delete page : AJAX		9	1	0
				[Close errors]
Node expected :	/ul[1]			
Result node :	/ol[1]			
Local name comparison	Expected "ul" but was "ol"			
5/7 [Web] Delete page : form		6	0	0
				[Display sysout]
6/7 [Web] Delete page : javascript		4	2	0
				[Display errors]
7/7 [Web] Scenario		12	0	0
				[Display sysout]

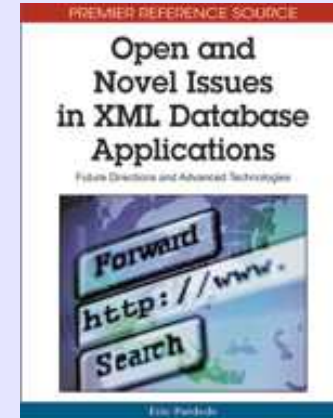
- SSL and certificates:
Could use a dummy certificate server-side
- JNDI support:
Would allow to have a testing environment that includes test databases (SQL, XQuery, etc) that could be initialized by the test suite
Right now: use the production database or duplicate the Web application
- WUnit/XUnit as an output language for Selenium ?
- A better error report (with HTML rendered fragments in the output)

About the engine

- Chap 8: "Native XML Programming: Make Your Tags Active" in "Open and Novel Issues in XML Database Applications: Future Directions and Advanced Technologies" (April 2009)

ISBN: 978-1-60566-308-1

<http://www.igi-global.com/reference/details.asp?ID=33277>



- Properties of schema mashups: dynamicity, semantic, mixins, hyperschemas

<http://www.balisage.net/Proceedings/html/2008/Poulard01/Balisage2008-Poulard01.html>

<http://hal.inria.fr/docs/00/32/26/61/ANNEX/Bal2008poul061003.pdf>

Balisage 2008
The Markup Conference

- Active Tags: Mastering XML with XML

<http://www.idealliance.org/papers/extreme/proceedings/html/2007/Poulard01/EML2007Poulard01.html>

<http://hal.inria.fr/docs/00/17/37/16/ANNEX/eml2007-active-tags.pdf>

2007
Extreme Markup Languages®
a registered trademark of IDEAlliance

- Active Tags: an XML system for Native XML Programming

<http://2006.xmlconference.org/programme/presentations/156.html>



Free, open source

RefleX

The Active Tags engine, in Java

- 110,000 lines of code (stripped from comments and blank lines)
- Jar size: 1.3MB

▪ Have the RefleX !

<http://reflex.gforge.inria.fr>

▪ XUnit:

<http://reflex.gforge.inria.fr/xunit.html>

▪ WUnit:

<http://reflex.gforge.inria.fr/wunit.html>

<http://reflex.gforge.inria.fr/wunit-quick-start.html>

▪ Active Tags:

<http://ns.inria.org/active-tags/>

<http://ns.inria.org/active-tags/references/references.html>

Questions ?