

# Ajax Debugging and Quality Assurance

AjaxWorld  
Dave Johnson  
Oct 3, 2006

# Overview

1. Who is this Guy? Who is nitobi?
2. Testing in Brief
  - I. Unit Testing
  - II. Functional Testing
  - III. Regression Testing
3. JavaScript Debugging
4. Performance Optimization
5. Conclusions

# Who is this Guy?

Who is this Guy? Who is nitobi?



# Dave Johnson

(that's me)

Who is this Guy? Who is nitobi?





# Co-founder + CTO Nitobi Software

(formerly eBusiness Applications)

Who is this Guy? Who is nitobi?



<http://blogs.nitobi.com/dave>

Nitobi Enterprise AJAX Podcast  
Enterprise AJAX - Addison Wesley

Who is this Guy? Who is nitobi?





Imperial College  
London

Who is this Guy? Who is nitobi?





Who is this Guy? Who is nitobi?



# Who is nitobi?

Who is this Guy? Who is nitobi?



# Ajax User-Interface Components for the Enterprise

Who is this Guy? Who is nitobi?





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vancouver bc

Search Maps

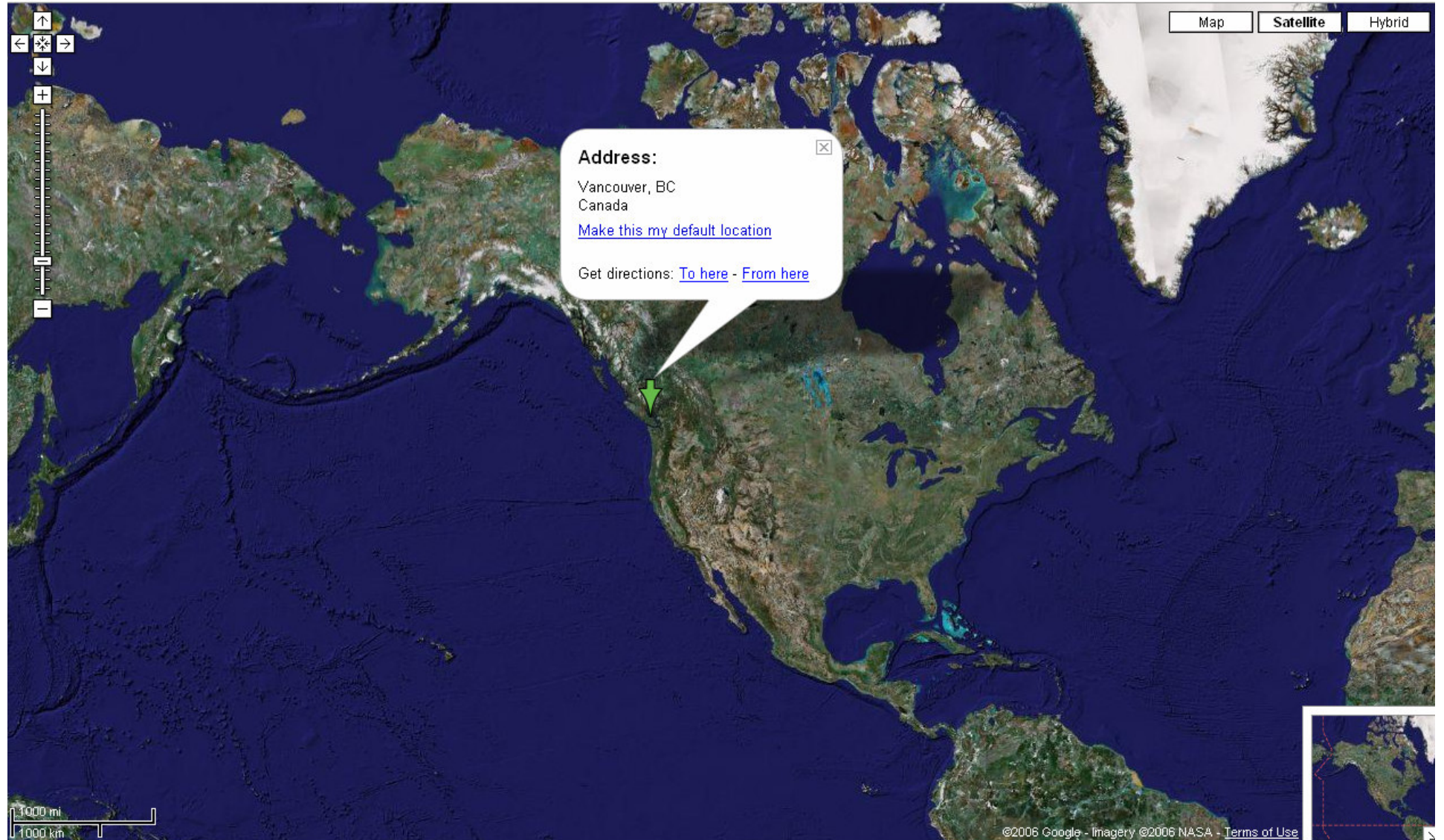
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Get directions

Maps

[Print](#) [Email](#) [Link to this page](#)



Who is this Guy? Who is nitobi?





# Our Customers



HunterDouglas



TimeWarner



Nestlé



SITA



✳️ BANK OF SCOTLAND



Who is this Guy? Who is nitobi?





# Overview

1. Who is this Guy? Who is nitobi?

**2. Testing in Brief**

I. Unit Testing

II. Functional Testing

III. Regression Testing

3. JavaScript Debugging

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<http://www.flickr.com/photos/magtravels/85630949/>

## Testing in Brief



# Quality Assurance

- Widely introduced during WWII
- Munitions industry demanded better quality and more reliable “products”
- Quality systems evolved to ISO 9001

**“rely on prevention rather than cure\*”**

\*we will get to curing later

# Why Bother

- Riches?
- Fame?
- Becoming a Jedi?

# It's About the Bugs Stupid

- Testing is about finding bugs
- Added bonus!



# Not \_All\_ About Bugs

- Performance (later)
- Usability (some other time)
- Accessibility (read the book)

# Development Philosophy

- Lots of development philosophies
  - Waterfall
  - Iterative
  - Agile / Extreme
  - <!-- insert cool new technique here -->





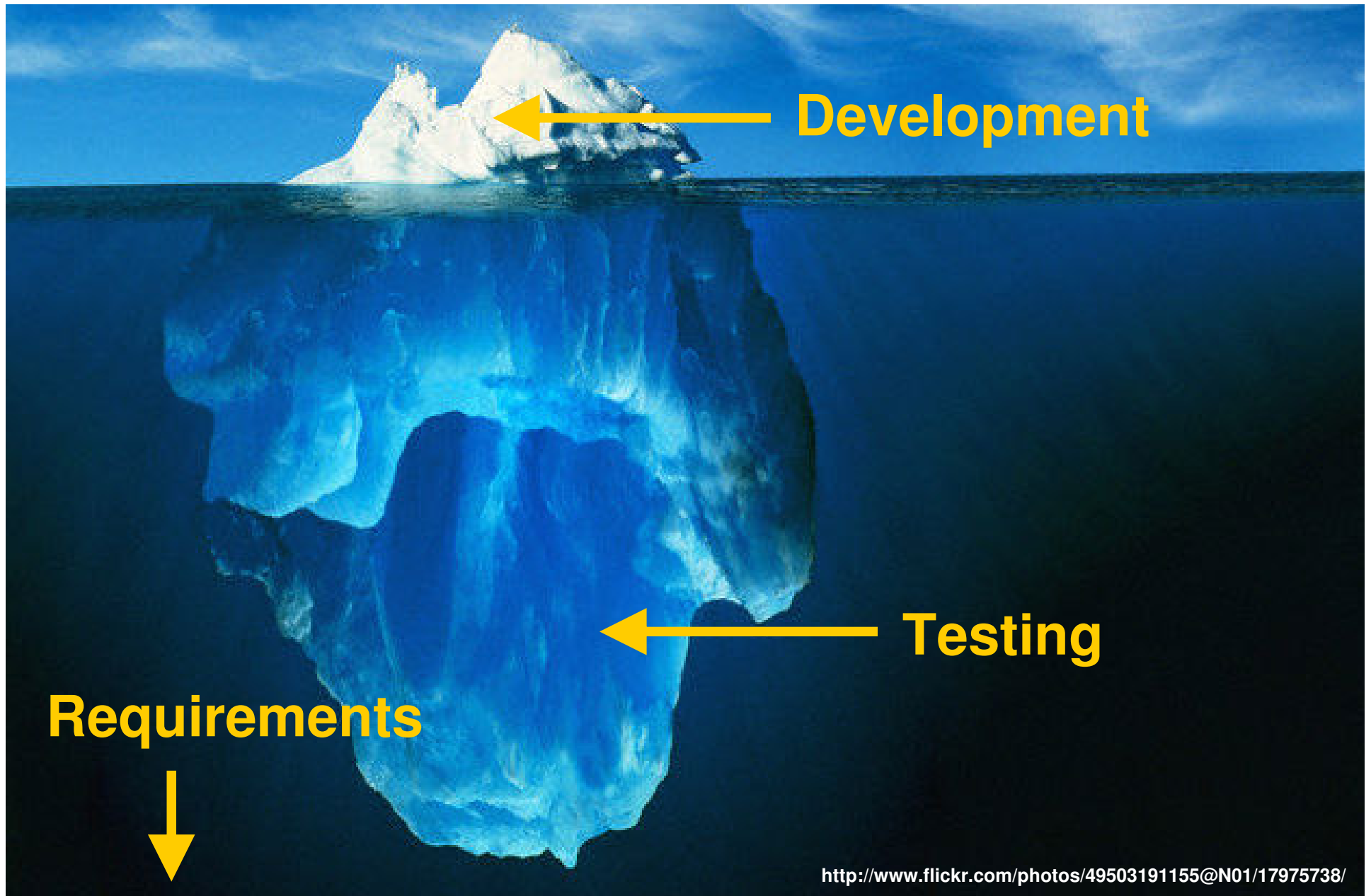
<http://www.flickr.com/photos/adulau/193596104/>

## Testing in Brief



# Many Stages of Testing

- Requirements
- Design
- Test Planning
- Test Development
- Test Execution
- Test Reporting



**Development**

**Testing**

**Requirements**

<http://www.flickr.com/photos/49503191155@N01/17975738/>

Testing in Brief

# Don't Forget

- Things as simple as bad documentation, or difficult tools can sink a product

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# Unit Testing

# Tools

- JSUnit
- JSMock
- HTTPUnit

# JSUnit

```
function setUpPage()  
{  
    setUpPageStatus = 'complete';  
}
```

```
function setUp()  
{  
    //...  
}
```

```
function testDoSomething()  
{  
    assertEquals("a", "b");  
}
```

# Method Overview

- setUpPage()
- setUp()
- tearDown()
- warn(message, [value])
- inform(message, [value])
- debug(message, [value])
- addTestSuite(filename)



File Edit View Go Bookmarks Tools Help del.icio.us

http://localhost/svn/EBALib/v13/Common/Test/Lib/jsunit/testRunner.html?testPa

Latest Headlines Time Tracking EBA Components - Trac EBA: Support :: Ticke... Using Default Render... Agile Testing: Testin...

**JsUnit 2.2 TestRunner**  
Running on Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US; rv:1.8.0.6) Gecko/20060728 Firefox/1.5.0.6

www.jsunit.net  
POWERED BY  
PIVOTAL

http:// localhost/svn/ebagrid/v30/Test/Common/UnitTests/eba.cachemap.test.html

Trace level:  ☐ Close old trace window on new run Page load timeout:  Setup page timeout:

**Status:** Done (3.594 seconds)

**Progress:**

**Runs:** 20 **Errors:** 0 **Failures:** 0

Errors and failures:

# Unit Testing

File Edit View Go Bookmarks Tools Help del.jcio.us

http://localhost/svn/EBALib/v13/Common/Test/Lib/jsunit/testRunner.html?testPac Go

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www.jsunit.net  
POWERED BY PIVOTAL

http:// localhost/svn/ebagrid/v30/Test/Common/UnitTests/eba.cachemap.broken.test.html Run

Trace level: no tracing ☒ Close old trace window on new run Page load timeout: 120 Setup page timeout: 120

**Status:** Done (2.031 seconds)

**Progress:**

**Runs:** 20 **Errors:** 0 **Failures:** 1

Errors and failures:

eba.cachemap.broken.test.html:testCacheMapInsert2 failed

Show selected Show all

http://localhost

! "Insert [50,60]"  
Expected <[30,40],[50,60]> (String) but was <[10,20],[30,40],[50,60]> (String)

Stack trace follows:

- > JsUnitException
- > \_assert
- > assertEquals
- > testCacheMapInsert2

OK

# Unit Testing

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Functional Testing

# Functional Testing

- Test the software according to the specification
- Functional testing steps:
  - Identification of functions that the software is expected to perform
  - Creation of test data that will exercise those functions

# Rule of Thumb

- For every tenfold increase in defects discovered an additional tester must be added



# Tools

- Selenium
  - Core
  - IDE
  - Remote Control
- Watir
- jWebUnit

http://localhost/svn/EBALib/v13/Common/Test/Selenium/TestRunr

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### Test Suite

[Basic Event Test](#)

[TableDataSource Test](#)

[Sorting Test](#)

*Not supported in this browser*

Skipped Tests

### Test Client Side Events

open	/svn/EBAGrid/v30/Test/DotNet/Common/Event
waitForCondition	getGrid("Grid1")!=null;
waitForCondition	getSeleniumDocument().getElementById("eba_g
click	dom=document.getElementById("eba_grid_cell_
assertExpression	javascript{getGrid("Grid1").testValues.clickEven

## Selenium TestRunner

Execute Tests

☒ Run ☐ Walk ☐ Step

**All** **Selected**

Continue

Elapsed: 00.00

Tests	Commands
<span style="color: green;">0</span> run	<span style="color: green;">0</span> passed
<span style="color: red;">0</span> failed	<span style="color: red;">0</span> failed
	<span style="color: orange;">0</span> incomplete

Tools

View DOM Show Log

↑

**Test Suite**

↑

**Current Test**

↑


**Control Panel**

## Selenium

by ThoughtWorks and friends

For more information on Selenium, visit

<http://selenium.openqa.org>



# Functional Testing



http://localhost/svn/EBALib/v13/Common/Test/Selenium/TestRunr

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**Test Suite**  
[Basic Event Test](#)  
[TableDataSource Test](#)  
[Sorting Test](#)  
*Not supported in this browser*  
**Skipped Tests**

**Test Client Side Events**  

open	/svn/EBAGrid/v30/Test/Common/TestPages/I
waitForCondition	getGrid('mySheet')!=null;
waitForCondition	getSeleniumDocument().getElementById("eba
waitForCondition	getSeleniumDocument().getElementById("eba
fireEvent	dom=document.getElementById("eba_grid_co
assertClass	dom=document.getElementById("eba_grid_co
assertClass	dom=document.getElementById("eba_grid_co
assertClass	dom=document.getElementById("eba_grid_co
assertClass	dom=document.getElementById("eba_grid_co
mouseDown	dom=document.getElementById("eba_grid_co

**Selenium TestRunner**  
Execute Tests  
☒ Run ☐ Walk ☐ Step  
All Selected  
Continue  
  
Elapsed: 00:25  

Tests	Commands
3 run	0 passed
3 failed	3 failed
	0 incomplete

Tools  
View DOM Show Log

**EBA:Grid Standard Paging**  
Standard Paging is demonstrated.

# Functional Testing

# This is a Test?

```
<table>
<tr><td>setVariable</td><td>username</td><td>'user'+(new Date()).getTime()</td></tr>
<tr><td>open</td><td>./selenium_ft_tool/setup?user=${username}</td><td></td></tr>
<tr><td>setVariable</td><td>base_url</td><td>'http://www.example.com:8080/Plone'</td></tr>
<tr><td>open</td><td>${base_url}</td><td></td></tr>
<tr><td>type</td><td>__ac_name</td><td>${username}</td></tr>
<tr><td>type</td><td>__ac_password</td><td>${username}</td></tr>
<tr><td>click</td><td>submit</td><td></td></tr>
<tr><td>verifyTextPresent</td><td>Welcome! You are now logged in</td><td></td></tr>
<tr><td>setVariable</td><td>myfolder_url</td><td>'${base_url}/${username}/folder'</td></tr>
<tr><td>click</td><td>//a[@href='${myfolder_url}']</td><td></td></tr>
<tr><td>verifyTextPresent</td><td>${username}</td><td></td></tr>
<tr><td>setVariable</td><td>homepage_url</td><td>'${base_url}/${username}/index/view'</td></tr>
<tr><td>click</td><td>//a[@href='${homepage_url}']</td><td></td></tr>
<tr><td>open</td><td>${member_url}</td><td></td></tr>
<tr><td>verifyTextPresent</td><td>Home page for ${username}</td><td></td></tr>
<tr><td>verifyTextPresent</td><td>Hello World!</td><td></td></tr>
<tr><td>open</td><td>./selenium_ft_tool/tearDown?user=${username}</td><td></td></tr>
</table>
```

Search

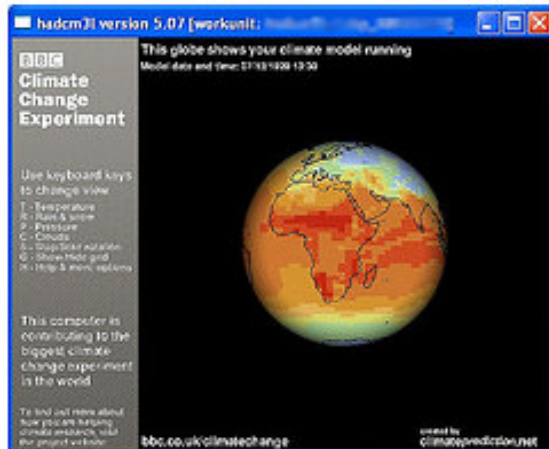
Everyone's Photos

climate change

☒ Full text ☐ Tags only

✓ We found 1,986 photos about **climate** and **change**.

View: Most relevant • Most recent • Most interesting



Climate Change M

Uploaded on 16 February 2006



By **murky**

See more photos

 [bbc](#), [climatechange](#), [globalwarming](#) ...



climate change

Uploaded on 13 June 2006

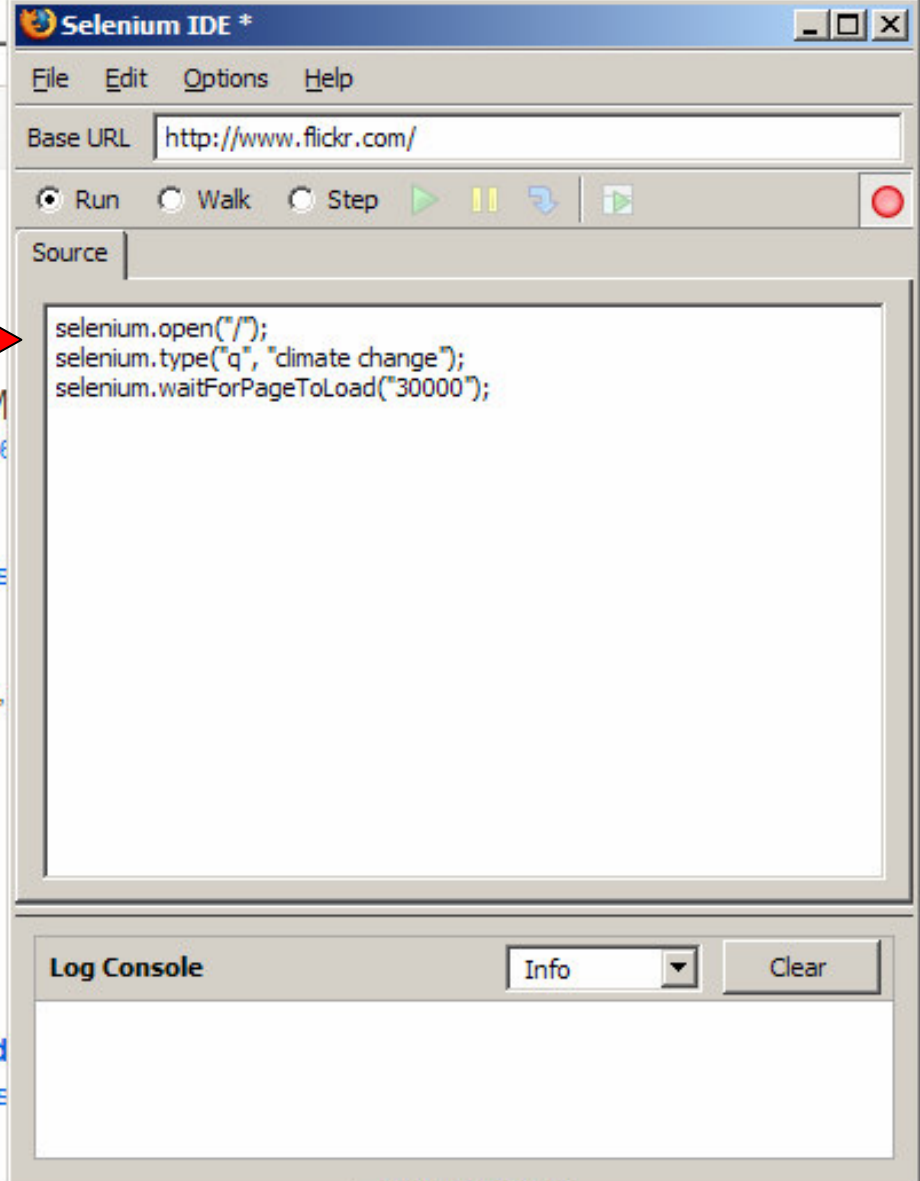


By **completed**

See more photos

 [dave](#), [bbc](#), [oxford](#), [frances](#) ...

[www.shop.com](#)



# Functional Testing



Everyone's Photos   [Advanced Search](#)

☒ Full text ☐ Tags only

✓ We found 1,986 photos about **climate** and **change**

[Show thumbnails](#)

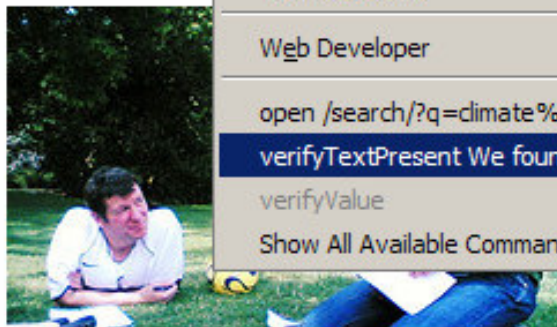
hadcm3 version 5.07 [w...]

**Climate Change Experiment**

Use keyboard keys to change view:  
 T - Temperature  
 A - Altitude  
 P - Pressure  
 C - Clouds  
 S - Sea level  
 G - Show grid  
 H - Help & more options

This computer is contributing to the biggest climate change experiment in the world.

To find out more about how you can help, please visit the project website: [bbc.co.uk/...](http://bbc.co.uk/...)



- Back
- Forward
- Reload
- Stop
- Bookmark This Page...
- Tag This Page...
- Save Page As...
- Send Link...
- View Background Image
- Select All
- Performancing
- View Page Source
- View Page Info
- Web Developer
- open /search/?q=climate%20change&w=all
- verifyTextPresent We found 1,986 photos about climate and change. View: Most rel...
- verifyValue
- Show All Available Commands

dave, bbc, oxford, frances ...

Sponsored Results

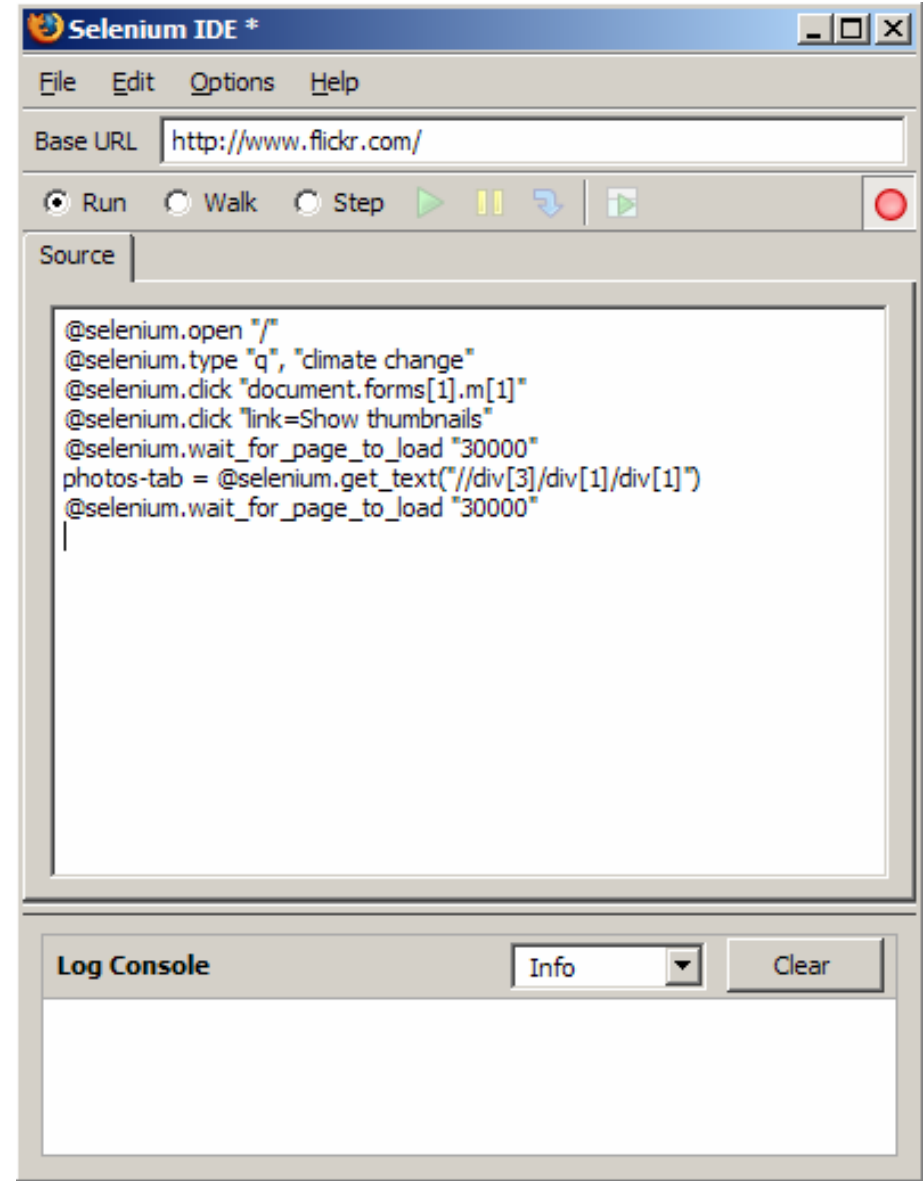
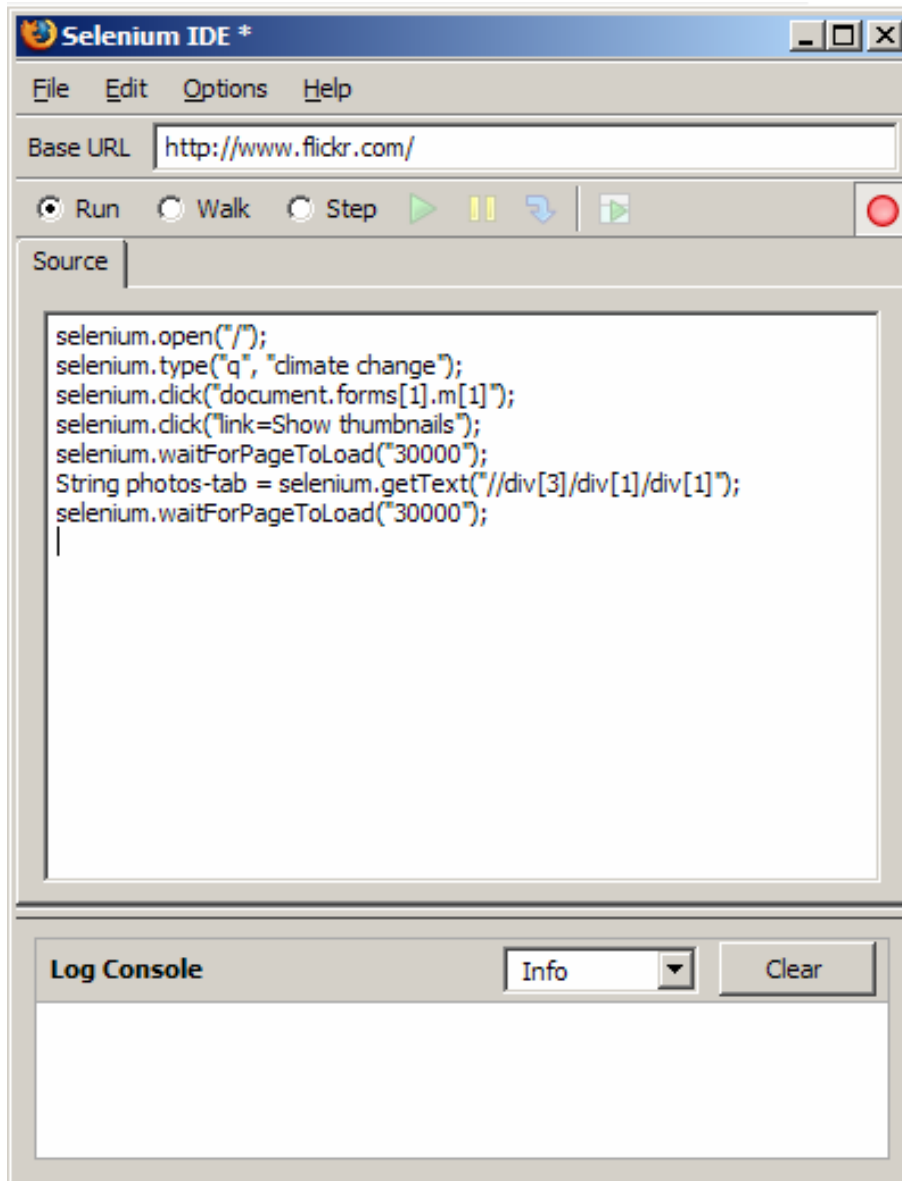
[Half.com @ - Official Site](#)  
**Climate Change Textbooks.**  
[www.half.com](http://www.half.com)

[ExecSearches.com](#)  
 Executive and senior management jobs in non-profit, public sector and socially conscious...  
[www.execsearches.com](http://www.execsearches.com)

[Research Climate Change at Questia](#)  
 Find quality info at the world's online library. 435,000 books, articles. Search or read full text, ...  
[www.questia.com](http://www.questia.com)

[A Change of Climate Book](#)  
 Buy a **change of climate** book at SHOP.COM. The new way to shop, one stop - start to...  
[www.shop.com](http://www.shop.com)

# Functional Testing



# Functional Testing

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<http://www.flickr.com/photos/rbos/91474426/>

# Automated Testing





<http://www.flickr.com/photos/adulau/193596104/>

# Automated Testing



# Why Regression Testing?

- With many people working the same code regression bugs are inevitable
- This can be painful

# Manual Testing

- Don't underestimate its value
- Introduces randomness
- We are *good* at noticing oddities
- We are *bad* at checking precise results

# Automated Testing

- This can be expensive
- The sooner you automate the greater value
- **Automated test value is in untargeted bugs it finds - completely unrelated to the specific purpose for which it was written**

# Automate Testing with Care

- Some automation is easy (read cheap)
- That's good!
- But cheap automation is unlikely to reveal bugs
- That's bad!
- Automated tests can find regression bugs
- That's good!
- Automate tests can be fragile
- That's bad!
- Automated tests can be run with The Build
- That's good!
- Automated tests can ignore large areas of the software
- That's bad!

# The Value Proposition

1. The more bugs you have the higher cost of automation
2. The more automation you have the fewer bugs you find
3. The more testing infrastructure you already have the better



# Golden Rule

$$TC = \frac{NB \times AT}{TI}$$

# Questions

- Do they test the right things?
- How many bugs do you know about?
- How long will tests be relevant?
- What is the value of the tests?

# First Steps

- Have few automated tests that **coarsely** cover the software – Smoke Test
- If the smoke test succeeds, the product is testable and a “good build”
- Pluses
  - Configuration changes are easily observed
  - Gross regressions are caught preemptively
  - Keeps emphasis on manual testing

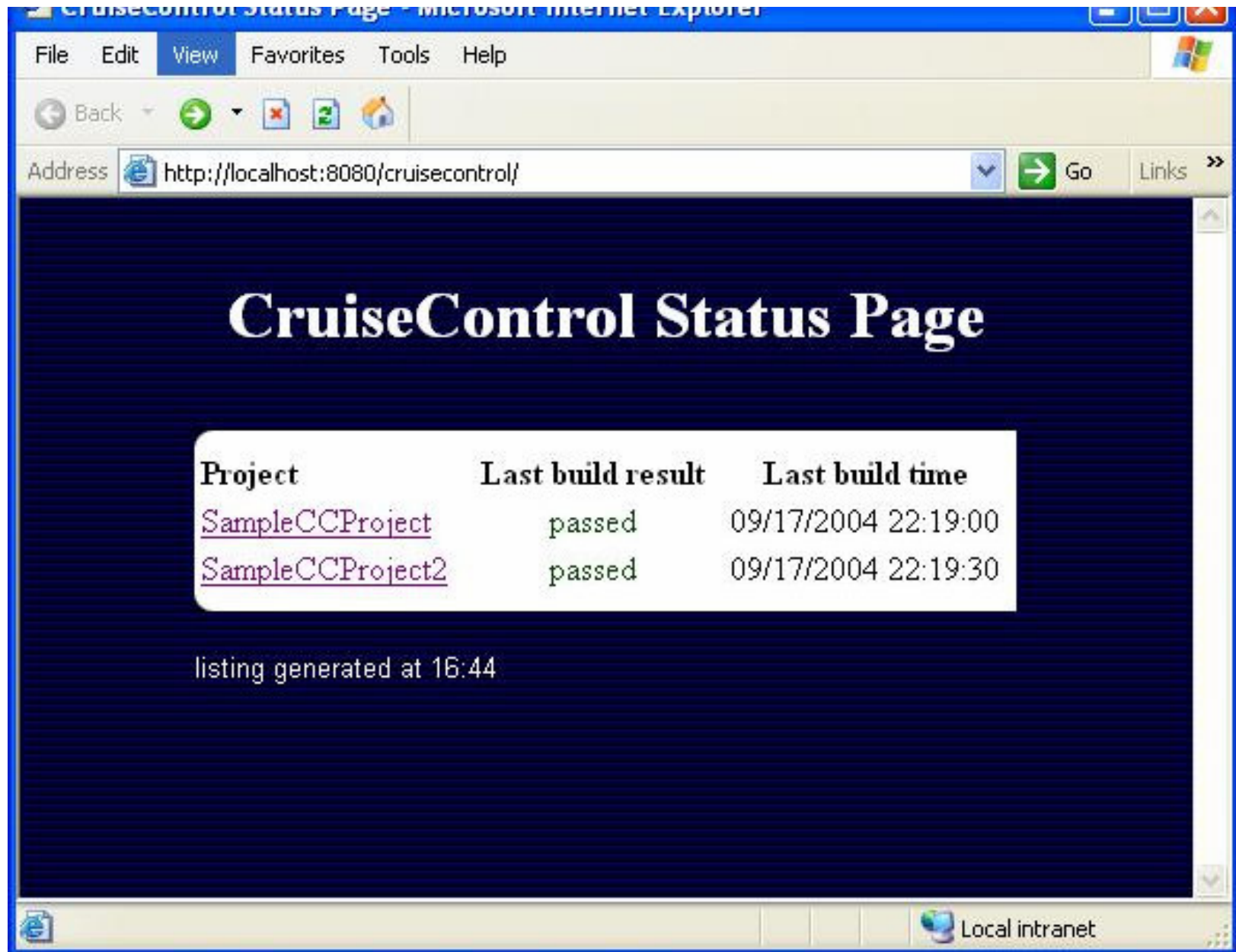
# Automate Functional / Unit Tests

- Selenium server
- JSUnit server

# Continuous Integration Tools

- CruiseControl
- AntHill
- Ant / NAnt





Automated Testing

Back Forward Stop Refresh Home AutoFill Print Mail

Address: http://localhost:8080/cruisecontrol/buildresults?log=log20020507042535 go

**cruisecontrol**  
continuous integration toolkit

Next Build Starts At:  
June 21, 2002 15:30

05/07/2002 15:29:03 (1.1)  
05/07/2002 04:25:35  
05/07/2002 02:38:58  
05/07/2002 01:03:55  
04/25/2002 09:28:00 (2-2)

**BUILD FAILED**

**Ant Error Message:** E:\Projects\cvs\cruisecontrol\main\sample\_project\build.xml:75: Compile failed, messages should have been provided.

**Date of build:** 20020507023938

**Time to build:** 6 seconds

**Last changed:** 05/07/2002 04:25:33

**Last log entry:**

**Errors/Warnings: (7)**

E:\Projects\cvs\cruisecontrol\main\sample\_project\src\java\hello\HelloWorld.java:7: illegal start of expression  
?  
^

E:\Projects\cvs\cruisecontrol\main\sample\_project\src\java\hello\HelloWorld.java:7: ';' expected  
?  
^

2 errors

**Unit Tests: (1)**  
All Tests Passed

**Modifications since last build: (1)**  
change User E:\Projects\cvs\cruisecontrol\main\sample\_project\src\java\hello\HelloWorld.java\HelloWorld.java

Local machine zone

# Automated Testing





<http://www.flickr.com/photos/ticklebug/4619205>

## Automated Testing

# Overview

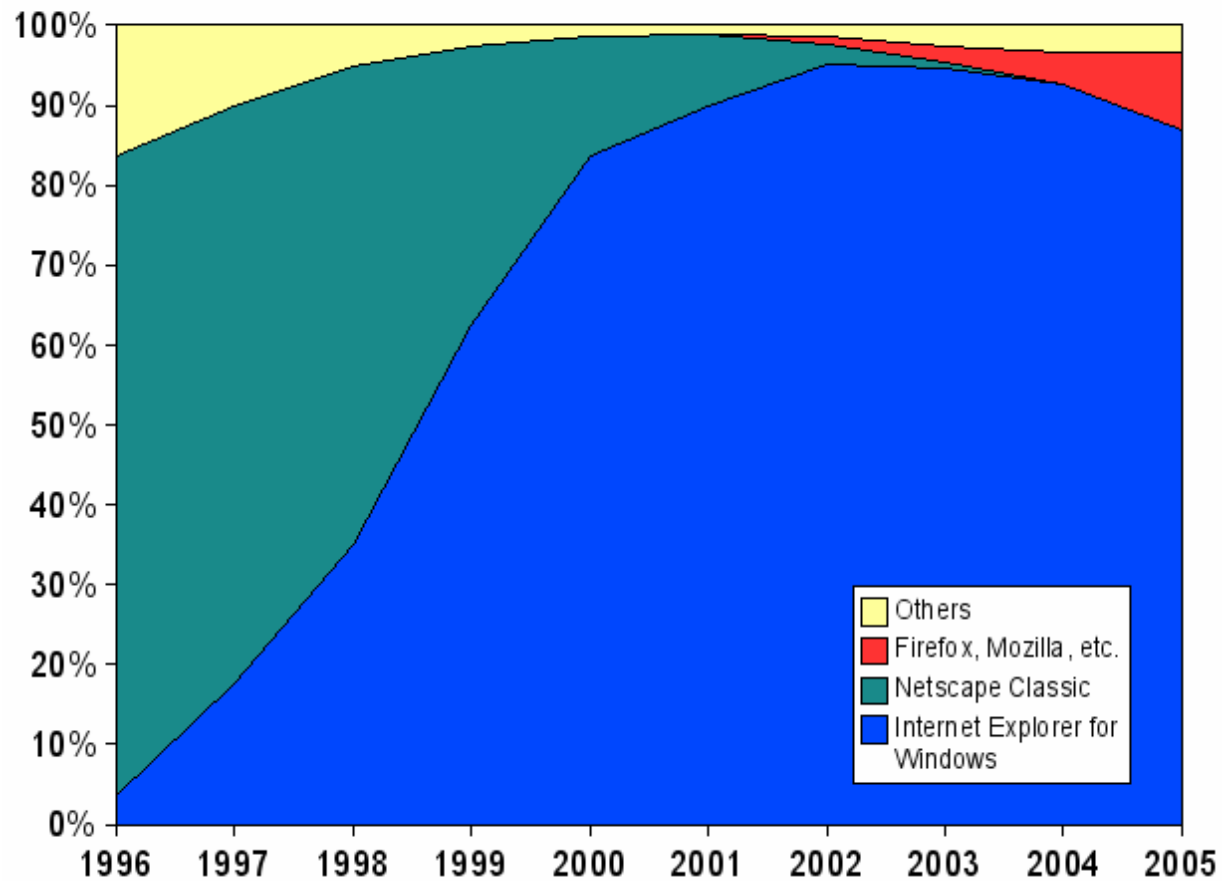
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# Finally

- Once the tests are written (and hopefully all fail) we can actually write some code.
- There's only one problem ...  
creating bugs



## Browser Wars





<http://www.flickr.com/photos/tonx/114398989/>

# JavaScript Debugging



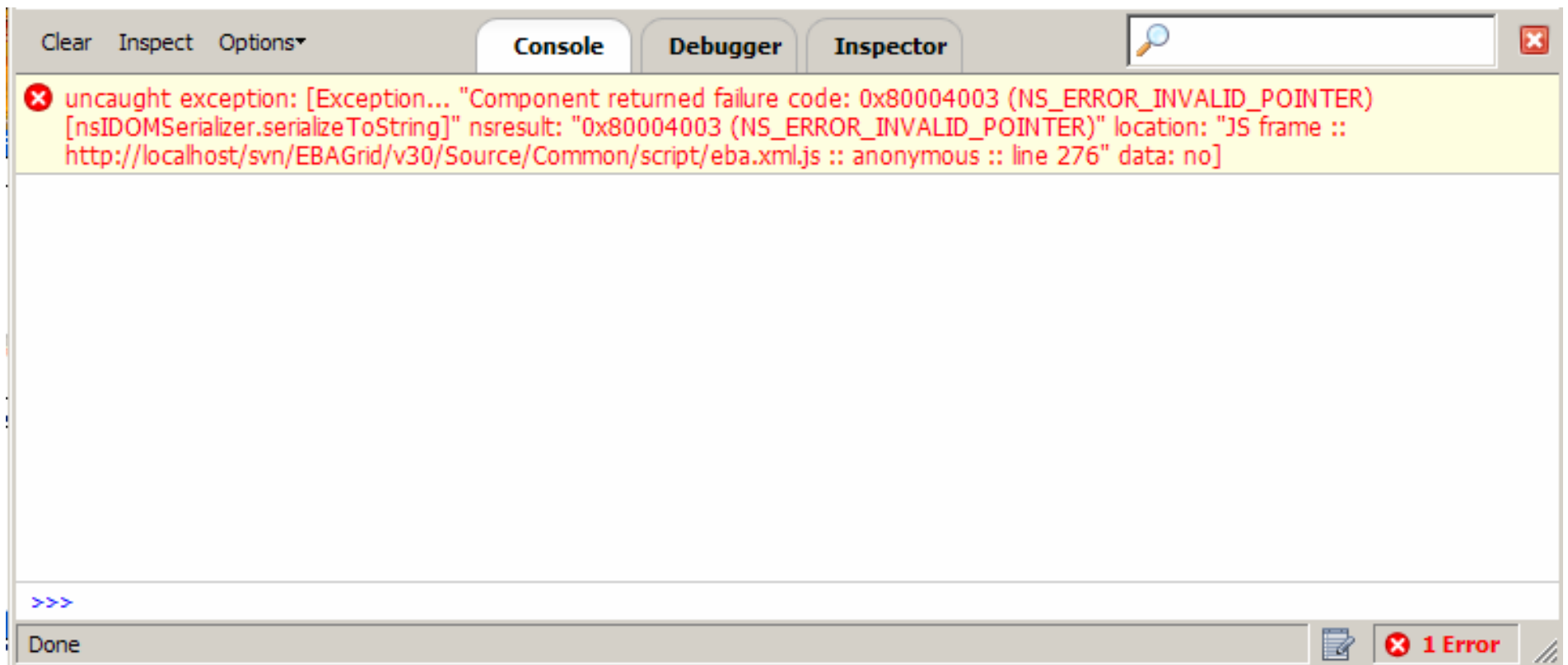






<http://www.flickr.com/photos/esther17/86558129/>

## JavaScript Debugging



## JavaScript Debugging

# Some Ground Rules

- Namespaces
  - nitobi.\$
- Asynchronous programming
  - watch out for IE
- Inheritance, interfaces etc
- Readable names
  - “CustomerFirstNameWithMiddleInitial” or “a”
- Global variables
  - `_this = this`
- Closures
- Frameworks
- Documentation



# Dealing with Errors

```
team.pack( );  
AppHelper.openModalDialog(t  
AddressHelper.getAddressBoo  
setList( );
```

```
}  
} catch (Exception e) {  
}
```

```
}  
}
```

<http://www.flickr.com/photos/davesag/8519770/>

# Logging is your Friend

- FVLogger
- Aspect Oriented Programming

# Tools

- Firebug (Mozilla)
- Developer Toolbar (IE & Mozilla)
- WebKit (Safari)

# Firebug

- `console.log('width: %d height: %d', w, h);`
- Write arrays, elements, whatever
- Debug, info, warn, error
- `console.trace`
- `console.time / timeEnd`

# Search

Photos

Groups

People

Everyone's Photos

climate change

SEARCH

[Advanced Search](#)

☒ Full text ☐ Tags only

✓ We found 2,274 photos about **climate** and **change**.

[Show thumbnails](#)

View: Most relevant • Most recent • Most interesting



climate change

Uploaded on 13 June 2006



By **completedesp...**

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**Climate Change**

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your opinion on energy issues.  
[www.willyoujoinus.com](http://www.willyoujoinus.com)

Clear

Inspect

Options

Console

Debugger

Inspector

```
<div class="Found">
  <span class="queryterm">climate</span>
  <span class="queryspecial"> and </span>
  <span class="queryterm">change</span>
  <div class="SortOptions">
  </div>
</div>
<br clear="all"/>
<table cellpadding="0" class="DetailResults">
<br clear="all"/>
```

/html/body/div[3]/div[2]/div[2]

Source

Style

Layout

Events

DOM

## JavaScript Debugging


Search **Photos** Groups People

Everyone's Photos  **SEARCH** [Advanced Search](#)


☒ Full text ☐ Tags only

✓ We found 2,274 photos about **climate** and **change**. [Show thumbnails](#)

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**climate change**  
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Join Chevron's forum and voice your opinion on energy issues.  
[www.willyoujoinus.com](http://www.willyoujoinus.com)

Clear Inspect Options ▾ Console Debugger **Inspector**

padding			
padding-top	0px	. Found	<a href="#">search.css.v1.11 (line 33)</a>
padding-bottom	5px	. Found	<a href="#">search.css.v1.11 (line 33)</a>
padding-left	25px	. Found	<a href="#">search.css.v1.11 (line 33)</a>
background			
background-color	transparent	. Found	<a href="#">search.css.v1.11 (line 33)</a>
background-image	url(http://www.flickr.com/images/icon_confirm.jpg)	. Found	<a href="#">search.css.v1.11 (line 33)</a>
background-repeat	no-repeat	. Found	<a href="#">search.css.v1.11 (line 33)</a>
background-attachment	scroll	. Found	<a href="#">search.css.v1.11 (line 33)</a>
font			
font-family	Arial, Helvetica, sans-serif	. Found	<a href="#">search.css.v1.11 (line 33)</a>

← → /html/body/div[3]/div[2]/div[2]

Source Style **Layout** Events DOM

Done

# JavaScript Debugging



Search **Photos** Groups People

Everyone's Photos  **SEARCH** [Advanced Search](#)

☒ Full text ☐ Tags only

✓ We found 2,274 photos about **climate** and **change**. [Show thumbnails](#)

View: Most relevant • Most recent • Most interesting



**climate change**  
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[www.willyoujoinus.com](http://www.willyoujoinus.com)

Clear Inspect Options▼ Console Debugger Inspector

<b>display</b> block	<b>margin</b> 0px, 0px, 0px, 0px	<b>offsetLeft/Top</b> 51, 221
<b>position</b> static	<b>border</b> 0px, 0px, 0px, 0px	<b>offsetWidth/Height</b> 720, 21
<b>visibility</b> visible	<b>padding</b> 0px, 0px, 5px, 25px	<b>clientWidth/Height</b> 720, 21
<b>float</b> none	<b>top/right/bottom/left</b> auto, auto, auto, auto	<b>scrollLeft/Top</b> 0, 0
	<b>width/height</b> 695px, 16px	<b>scrollWidth/scrollHeight</b> 720, 21

← → /html/body/div[3]/div[2]/div[2] Source Style Layout Events DOM

Done

# JavaScript Debugging

Search Photos Groups People

Everyone's Photos climate change SEARCH Advanced Search

☒ Full text ☐ Tags only

✓ We found 2,274 photos about climate and change. [Show thumbnails](#)

View: Most relevant • Most recent • Most interesting

climate change  
Uploaded on 13 June 2006

By completedesp...  
See more photos, or visit his profile.

Sponsored Results  
[Online Energy Debate: Climate Change](#)  
Join Chevron's forum and voice your opinion on energy issues.  
[www.willyoujoinus.com](http://www.willyoujoinus.com)

Clear Inspect Options Console Debugger Inspector

```
className      "Found"
childNodes     [ 7 ]
style          [ 0 ]
id             ""
nodeType       1
localName      "DIV"
previousSibling [Text] "\n "
parentNode     <div class="ResultSet">
firstChild     [Text] "\n          We found 2,274 photos about "
tagName        "DIV"
```

/html/body/div[3]/div[2]/div[2]

Source Style Layout Events DOM

Done

# JavaScript Debugging

# Debugger

- Most important JavaScript keyword?

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<http://www.flickr.com/photos/pulpolux/192587812/>

## Performance Optimization



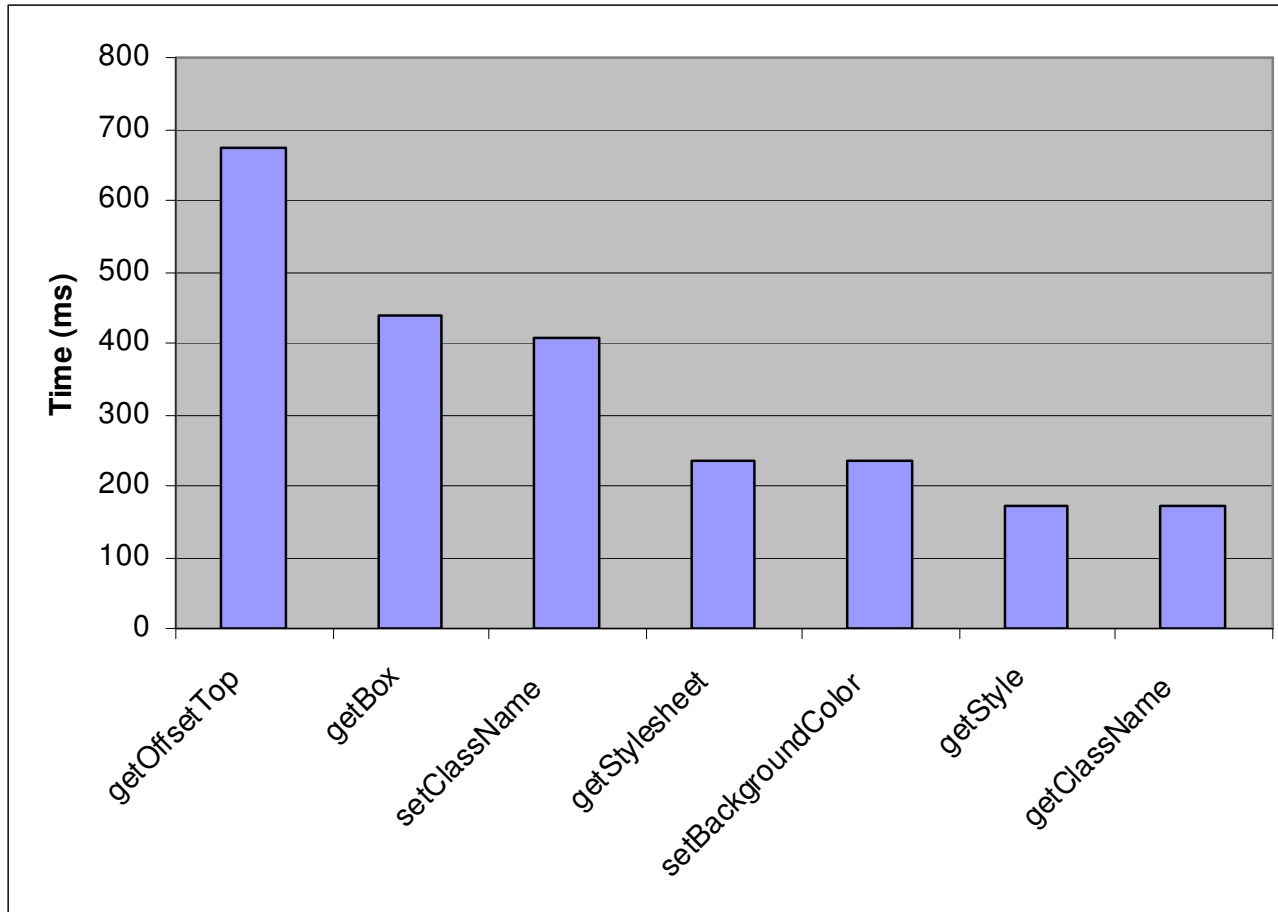
# Golden Rule (#2)

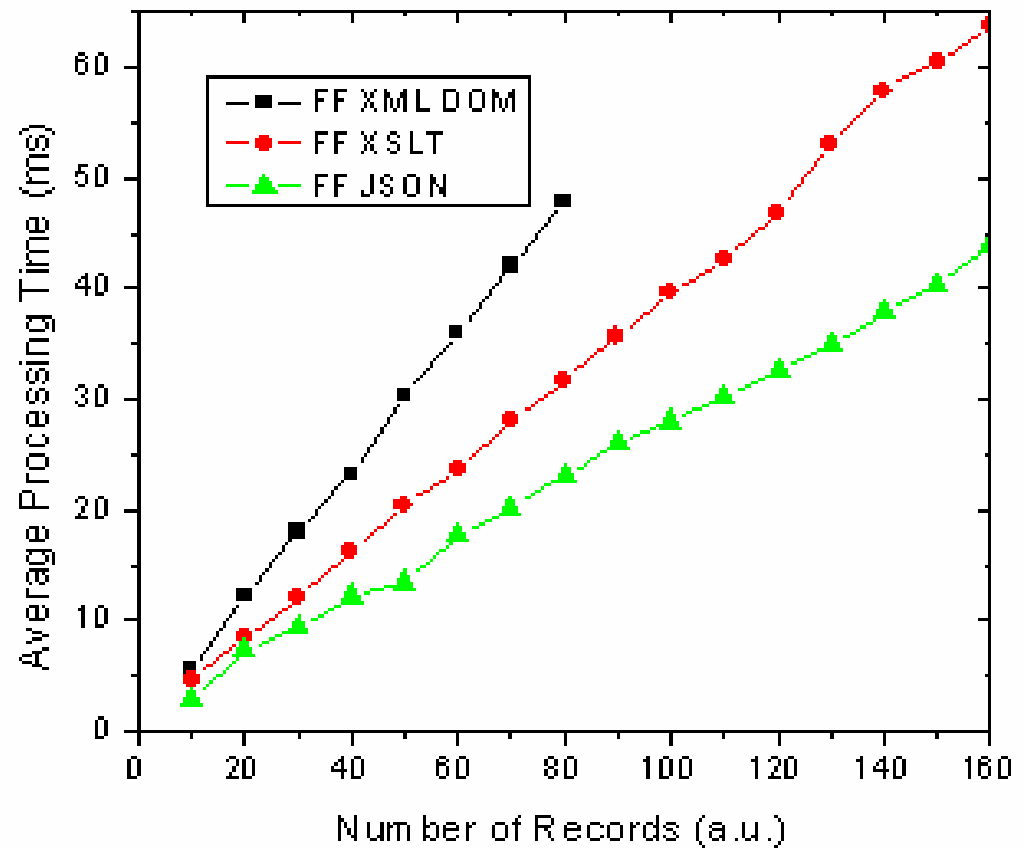
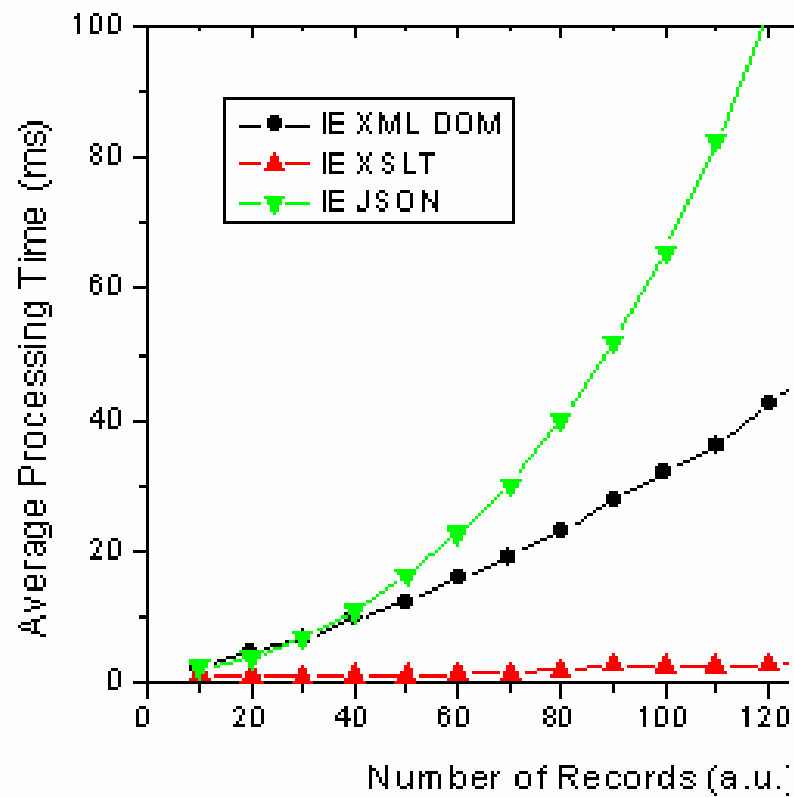
- Ask questions first optimize later

# Optimization

- Situation dependent
- How much data?
- What type of data?
- How many server hits?
- What are the common workflows?

# Big Picture





# Performance Optimization

# Most Wanted

- innerHTML
- offsetTop / Left
- getBoundingClientRect / getBoxObjectFor
- Stylesheets



# Tools

- Drip
- Logging / Debugging

Drip - DSCF0441[1] on Flickr - Photo Sharing!

Address: <http://www.flickr.com/photos/35437199@N00/224284112/in/photostream/> Go Auto-Refresh Page


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## DSCF0441[1]

ADD NOTE SEND TO GROUP ADD TO SET BLOG THIS ALL SIZES ORDER PRINTS ROTATE DELETE X



Uploaded on August 24, 2006 by [davyjones](#)

davyjones' photostream

200 photos View as slideshow

Tags: fixie [x], kayak [x], jack [x], dumpsterdive [x], scienceworld [x]

Memory Usage: 71385088

Show DOM Usage Show DOM Leaks

# Performance Optimization

# Overview

1. Who is this Guy? Who is nitobi?
2. Testing in Brief
  - I. Unit Testing
  - II. Functional Testing
  - III. Regression Testing
3. JavaScript Debugging
4. Performance Optimization
5. Conclusions

# Conclusions

- Assuring quality is an expensive task
- There ***is*** value in testing
- Don't test ***too*** much
- Use all the tools at your disposal
- Optimize with care

# Propaganda

- Talk to me for
  - Enterprise Ajax book flyers
  - Free Ajax component licenses