



Practical Parallels: From Development on the Java™ Platform to Development With the JavaScript™ Programming Language

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www.nitobi.com

TS-9624

Goal

Learn about the tools and techniques for testing, debugging, and deploying JavaScript™ programming languages applications

Agenda

Who I Am

JavaScript Programming Language Testing

- Unit Testing

- Functional Testing

- Regression Testing

JavaScript Programming Language Debugging

JavaScript Programming Language Deployment

Summary

Who I Am

- Nitobi Enterprise Ajax Podcast
- Enterprise Ajax book (Addison Wesley)
- blogs.nitobi.com/dave



Imperial College
London

What Do I Do?

- Nitobi co-founder
- Located in Vancouver, Canada
- Ajax user-interface components for the enterprise

Clients



HunterDouglas



TOTAL

Lucent Technologies
Bell Labs Innovations



SIEMENS



CERIDIAN



TimeWarner

Goldman
Sachs



tyco



Nestlé

✳️ BANK OF SCOTLAND



SITA



Agenda

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

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”

It's About the Bugs

- Testing is about finding bugs
- Added bonus!



**Now With
Code
Coverage!**

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 -->

The Many Faces of Testing

- Requirements
- Design
- Test planning
- Test development
- Test execution
- Test reporting

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<http://www.flickr.com/photos/thomashawk/85441961/>

Testing Tools

- JSUnit
- JSMock
- HTTPUnit

JUnit

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

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

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

JUnit Method Overview

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



JsUnit Test Runner - Mozilla Firefox

File Edit View Go Bookmarks Tools Help deljcio.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

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

Done

JUnit Test Runner - Mozilla Firefox

File Edit View Go Bookmarks Tools Help deljcio.us

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

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

JUnit 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.broken.test.html

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

Status: Done (2.031 seconds)

Progress:

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

Errors and failures:

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

http://localhost

! "Insert [50,60]"

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

Stack trace follows:

- > JUnitException
- > _assert
- > assertEquals
- > testCacheMapInsert2

Done

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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

Functional Testing Tools

- Selenium
 - Core
 - IDE
 - Remote control
- Watir
- jWebUnit

Selenium Functional Test Runner v0.7.0 [1007M] - Mozilla Firefox

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

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

Latest Headlines Time Tracking EBA Components - Trac EBA: Support :: Ticke... XML.com: JSON and ... Jack Slocum's Blog > >>

Test Suite	
Basic Event Test	
TableDataSource Test	
Sorting Test	
<i>Not supported in this browser</i>	
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**

Elapsed: 00.00

Tests **Commands**

● run ● passed

● failed ● failed

● incomplete

Tools

↑

Test Suite

↑

Current Test

↑

Control Panel

Selenium

by ThoughtWorks and friends

For more information on Selenium, visit

<http://selenium.openqa.org>

Selenium Functional Test Runner v0.7.0 [1007M] - Mozilla Firefox

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

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

Latest Headlines Time Tracking EBA Components - Trac EBA: Support :: Ticke... XML.com: JSON and ... Jack Slocum's Blog > ...

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/F
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.

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=${username}</td><td></td></tr>
<tr><td>setVariable</td><td>base_url</td><td>'http://www.example.com:8080/'</td></tr>
<tr><td>open</td><td>${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>
</table>
```



DEMO

Selenium IDE



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

Why Regression Test?

- 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**

The Good and the Bad

Comparing aspects of automated testing

	Good	Bad
Easy	X	
Misses important bugs		X
Find regression bugs	X	
Fragile		X
Run with the build	X	
Ignore functionality		X

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 to Ask

- 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

Test Automation Tools

- Selenium server
- JSUnit server

- CruiseControl
- AntHill
- Ant/NAnt



DEMO

JUnit Server

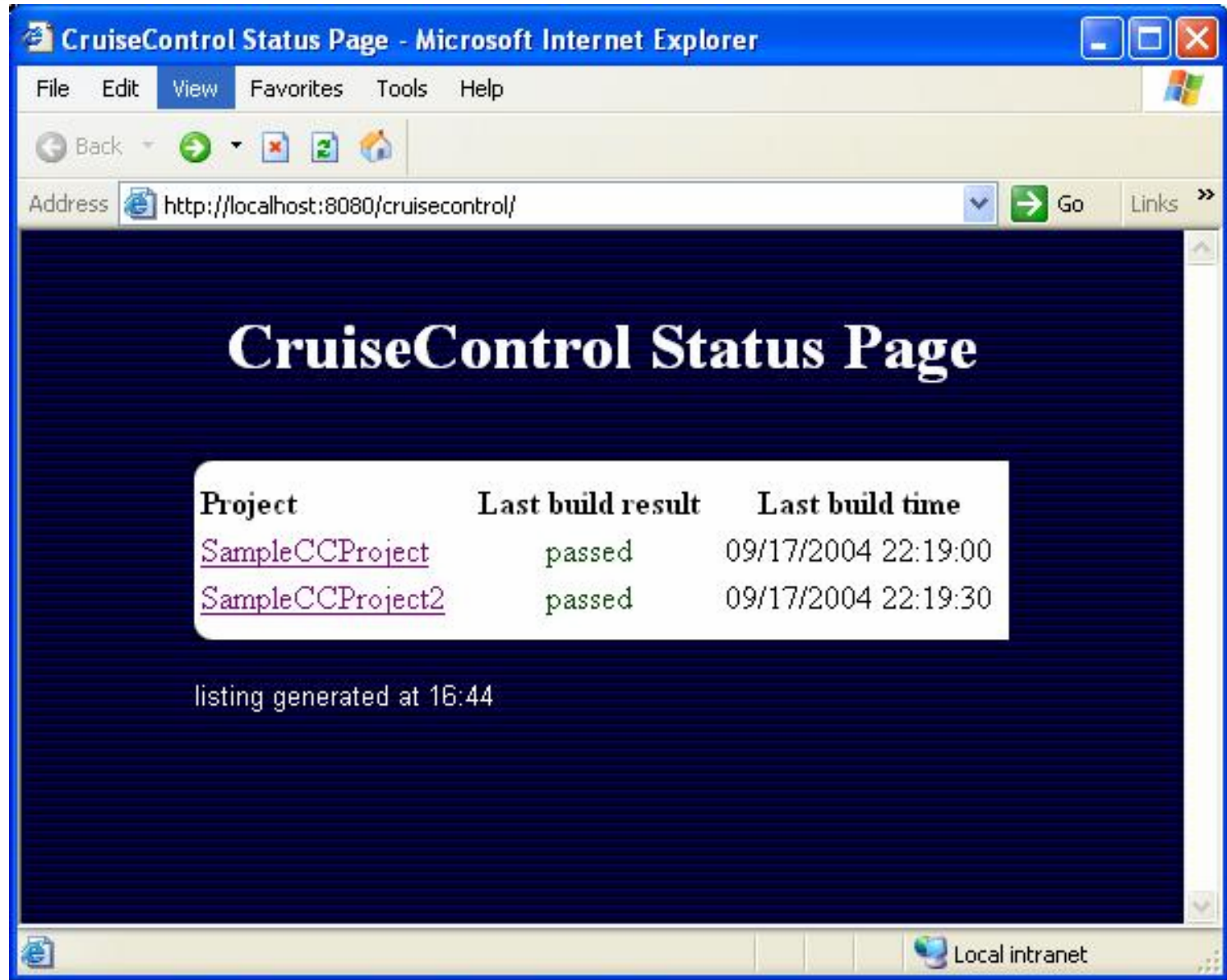




DEMO

Selenium Server





CruiseControl Status Page - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home

Address <http://localhost:8080/cruisecontrol/> Go Links >>

CruiseControl Status Page

Project	Last build result	Last build time
SampleCCProject	passed	09/17/2004 22:19:00
SampleCCProject2	passed	09/17/2004 22:19:30


listing generated at 16:44

Local intranet

⊙ CruiseControl Build Results

Back Forward Stop Refresh Home AutoFill Print Mail

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



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

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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

Internet Explorer

 Problems with this Web page might prevent it from being displayed properly or functioning properly. In the future, you can display this message by double-clicking the warning icon displayed in the status bar.

Always display this message when a page contains errors.

OK Hide Details <<

Line: 1163
 Char: 2
 Error: 'null' is null or not an object
 Code: 0

URL: https://www3.imperial.ac.uk/portal/page?nameid=41321758&dad=portallive&schema=PORTALLIVE

Previous Next



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



Clear Inspect Options ▾

Console Debugger Inspector

✘ uncaught exception: [Exception... "Component returned failure code: 0x80004003 (NS_ERROR_INVALID_POINTER) [nsIDOMSerializer.serializeToString]" nsresult: "0x80004003 (NS_ERROR_INVALID_POINTER)" location: "JS frame :: http://localhost/svn/EBAGrid/v30/Source/Common/script/eba.xml.js :: anonymous :: line 276" data: no]

>>>

Done ✘ 1 Error

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

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

```
}
```

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

```
}
```

```
}
```

Debugging Tools

- Firebug (Mozilla)
- Developer toolbar (IE and 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`



DEMO

Firebug

<code>

Most Important JavaScript Programming Language Keyword

debugger;

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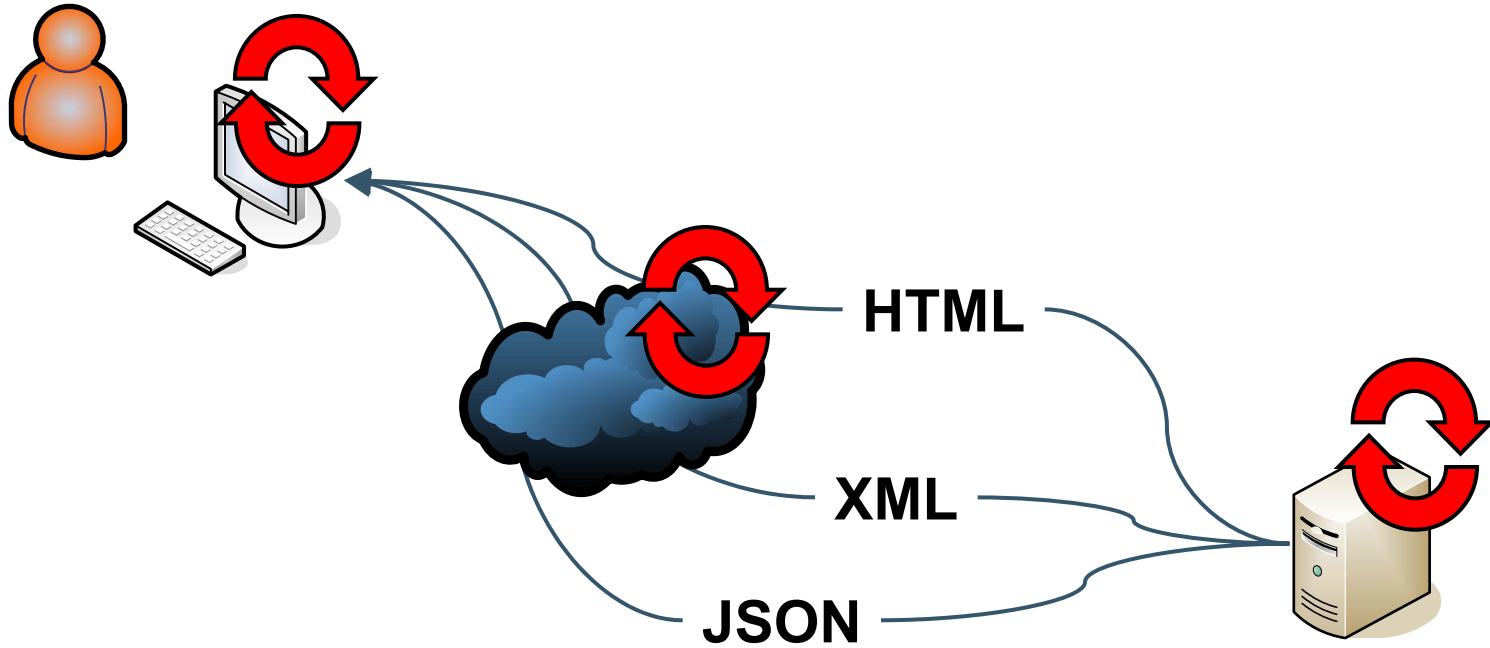
Summary



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

Optimization

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



Server Exec Time Transfer Time Parse Time Render Time

Firefox

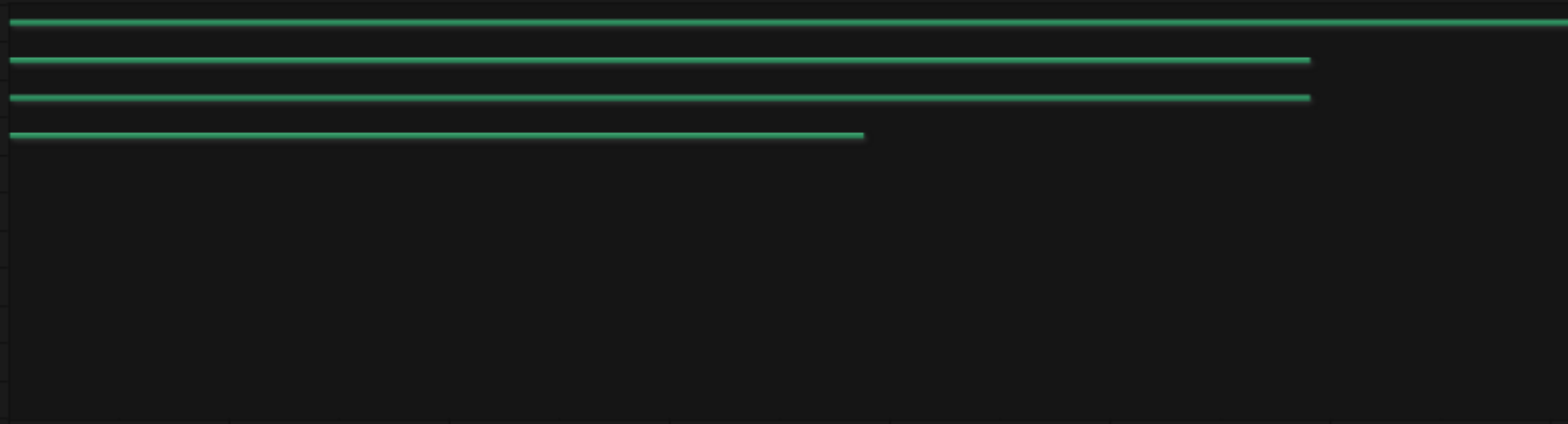
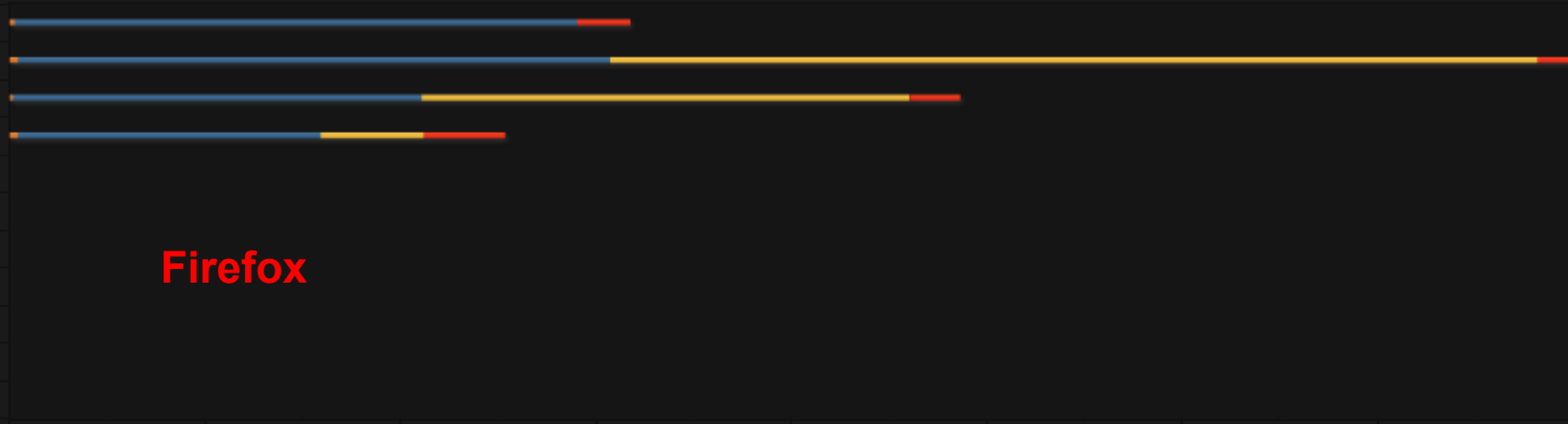
- Ajax HTML
- Ajax SOAP
- Ajax XML
- Ajax JSON
- Dojo
- Flex SOAP AS
- Flex SOAP E4X
- Flex XML AS
- Flex XML E4X
- Flex AMF3
- Flex Paged

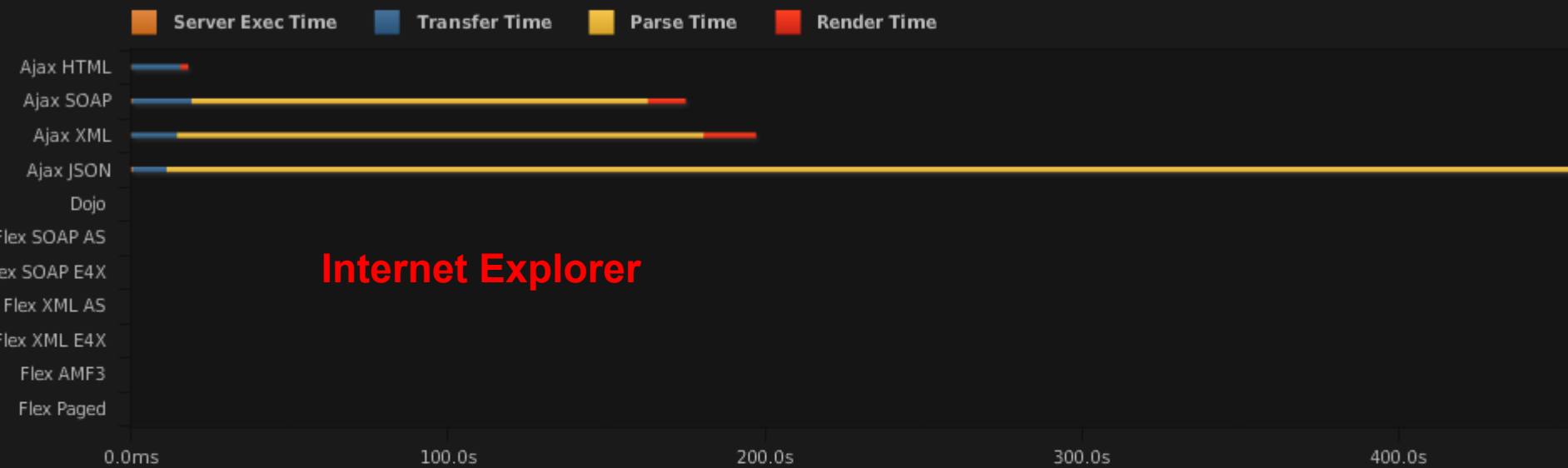
0.0ms 10.0s 20.0s 30.0s 40.0s 50.0s 60.0s 70.0s 80.0s

Data Bandwidth ▾

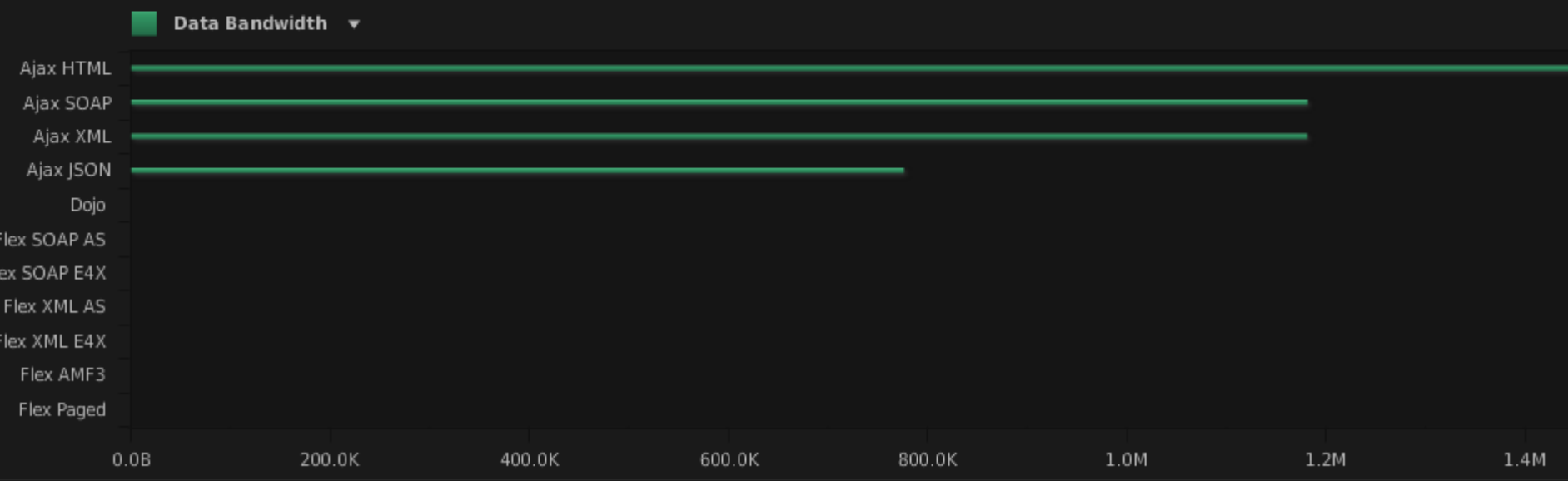
- Ajax HTML
- Ajax SOAP
- Ajax XML
- Ajax JSON
- Dojo
- Flex SOAP AS
- Flex SOAP E4X
- Flex XML AS
- Flex XML E4X
- Flex AMF3
- Flex Paged

0.0B 200.0K 400.0K 600.0K 800.0K 1.0M 1.2M 1.4M



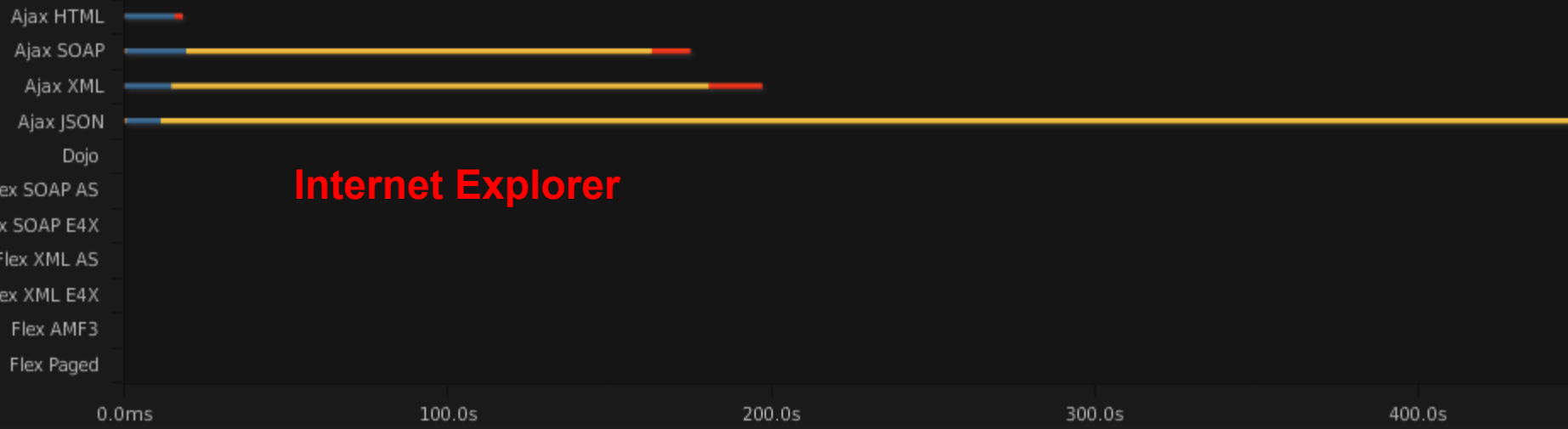


Internet Explorer

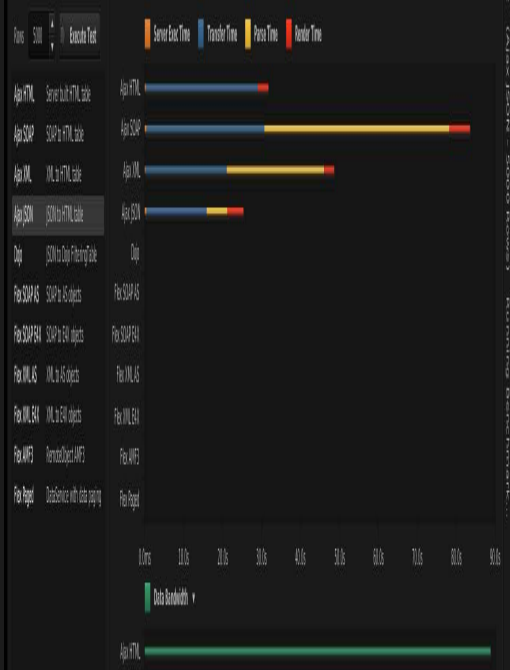


Server Exec Time Transfer Time Parse Time Render Time

Internet Explorer

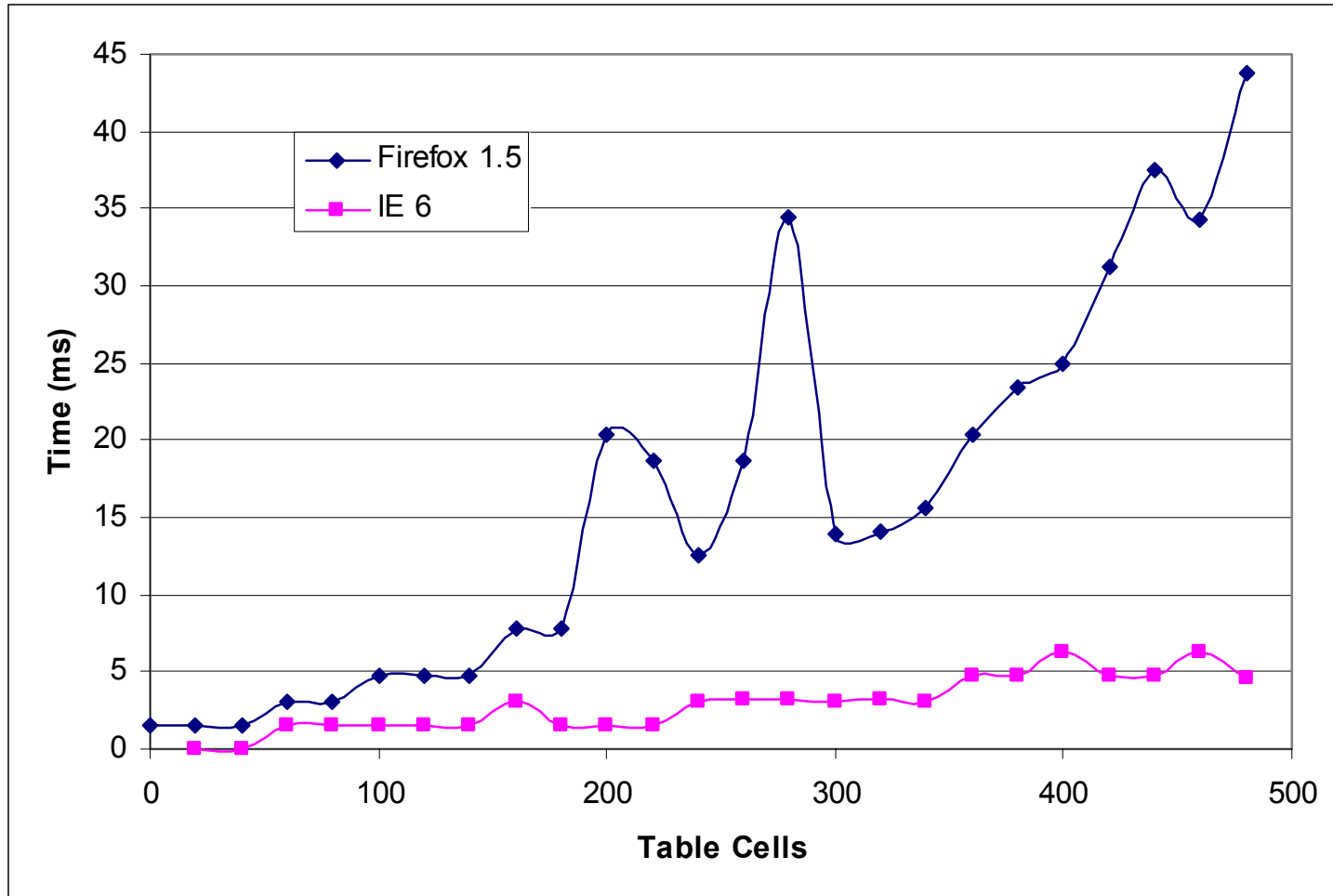


Firefox

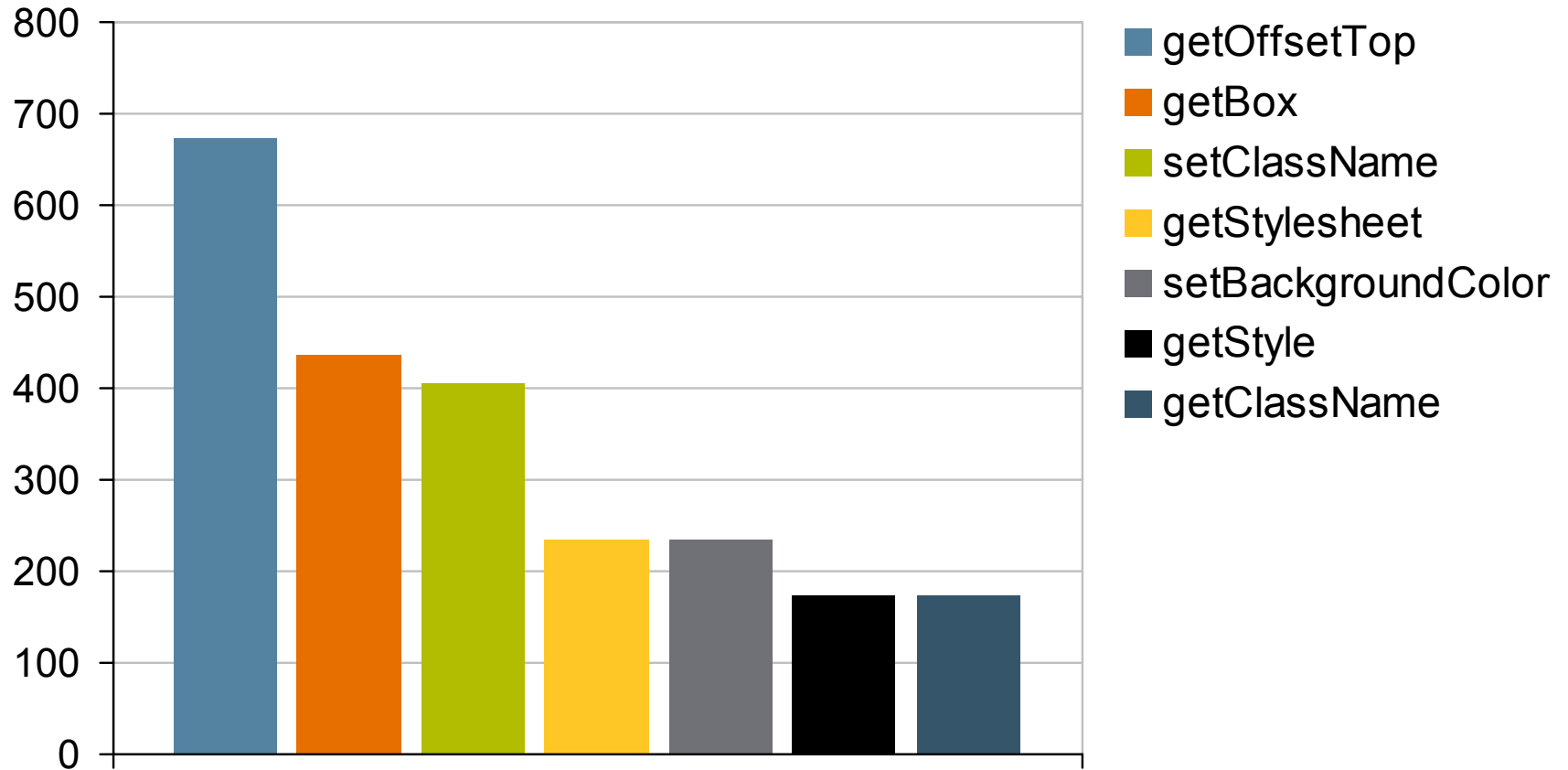


<http://www.jamesward.org/census/>

XSLT Cross Browser Performance



Big Picture



Most Wanted

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

- Consider HTML tags, styles, events

Documentation

- JSDoc

@constructor	Class constructor
@class	Class name
@param	Method or function arguments
@extends	Parent class
@type	The function return type of field / property type (number, string etc)
@see	Linking across classes and methods

JSDoc Markup

```
/**
 * Creates a new SimpleDataTable instance
 * @class Simple class for storing record based data from the server.
 * @constructor
 * @extends entAjax.DataModel
 */
entAjax.SimpleDataTable = function(data) {
  /**
   * Contains the data rendered in the DataTable
   * @private
   * @type {Array}
   * @see entAjax.DataModel#get
   */
  this.m_data = data;
}
/**
 * @return Returns data from the server.
 * @param {String} url The URL of the location of the data on the server
 * @type
 */
entAjax.SimpleDataTable.prototype.get = function(url) {}
```

JavaScript Compression

- Removing comments
- Removing whitespace
- Removing new-line characters
- Replacing variables with shorter names

Simple Example

```
/**
 * @private
 */
var _calcAverage = function(aNumber) {
    var nTotal = 0;
    var iLength = aNumber.length;
    for (var iIndex = 0; i<iLength; i++) {
        nTotal += aNumber[iIndex];
    }
    return nTotal/iLength;
}
/**
 * Calculates the average of an array of numbers.
 * @param {Array} Array of numbers to average.
 */
var calcAverage = _calcAverage;
```

```
var _a = function(a) {var b=0;var c=a.length;for (var
d=0;d<c;d++) {b+=a[d];}return b/c;}var calcAverage=_a;
```

Ant Based Minification/Obfuscation

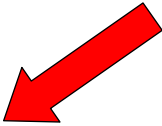
```
<target
  name="obfuscateJS"
  description="compress and obfuscate code">
  <java
    classname="org.mozilla.javascript.tools.shell.Main"
    dir="{basedir}\build\rhino\bin\"
    fork="true"
    output="{basedir}\output\src_obfuscated.js">
    <arg line="-c {basedir}\output\src.js" />
    <classpath>
      <pathelement path="{basedir}\build\rhino\bin\js.jar" />
    </classpath>
  </java>
</target>
```

Compression

- Request
 - **Accept-Encoding: gzip, deflate**
- Response
 - **Content-Encoding: gzip || deflate**
- IIS and Apache dynamically GZip / Deflate content and cache it
- All modern browsers support compressed content
 - Internet Explorer 6 SP1 had some problems
- IE, Firefox, Opera accept compressed content **_without_ Content-Encoding** header

Apache Config

```
# Compress everything unless excluded below.  
SetOutputFilter DEFLATE  
SetInputFilter DEFLATE  
SetEnvIfNoCase Request_URI \.(?:gif|jpe?g|png)$ no-gzip dont-vary  
SetEnvIfNoCase Request_URI \.(?:exe|t?gz|zip|bz2|rar)$ no-gzip dont-vary  
SetEnvIfNoCase Request_URI \.(?:pdf|avi|mov|mp3|rm)$ no-gzip dont-vary  
  
# Explicitly compress certain file types  
AddOutputFilterByType DEFLATE text/html text/plain text/xml
```



How Small is It?

Expected results for JavaScript compression

	Size (Kb)
Original	9.3
Minify	3.9
GZip / Deflate	2.8
Minify + GZip / Deflate	1.3
<i>Size Reduction</i>	86%

Content Merging

- Reduce download overhead by merging resources
 - JavaScript
 - Cascading Stylesheets
 - Images
- Careful with caching though!

Image Merging

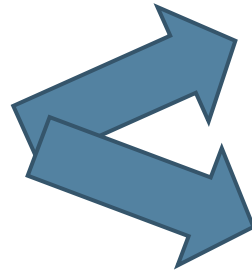


Image Merging

```
<html>
  <head>
    <style type="text/css" media="screen">
      .colour {clip: rect(0px 135px 125px 0px);}
      .grayscale {
        left:-135px;
        clip: rect(0px 270px 125px 135px);
      }
      .grayscale, .colour {
        position:absolute;
        width: 270px;height: 125px;
        background: url(images/nitobi.jpg);
      }
      .container {
        height:125px;width:135px;
        position:relative;
      }
    </style>
  </head>
  <body>
    <div class="container"><div class="colour"></div></div>
    <div class="container"><div class="grayscale"></div></div>
  </body>
</html>
```

clip: rect(0px 135px 125px 0px);

clip: rect(0px 270px 125px 135px);

background: url(images/nitobi.jpg);

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- 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



Q&A

<code/>



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www.nitobi.com

TS-9624