Mobile Devices – Bakeoff
www.blaze.io

Michael Weider, CEO
Agenda

• Introduction to Mobitest
• Results of testing top 500 sites
• Factors most correlated with performance
• Conclusions and recommendations
The reports of my death are greatly exaggerated?
Mobile WPO Challenges

Smartphone Share
Feb - Apr 2011, Nielsen Mobile Insights, National

- Android OS, 36%
- RIM BlackBerry OS, 23%
- Apple iOS, 26%
- Windows Mobile, 9%
- Palm OS, 1%
- Symbian OS, 2%
- HP WebOS, 2%
- Windows Phone 7, 1%

Source: Nielsen
Intro to Mobitest
• **Mobile Web Performance Measurement**
  

Test Your Website Performance On A Mobile Device

**What Is The Mobitest Web Performance Tool?**

The Mobitest Performance Tool uses real iPhone and Android agents to conduct a performance analysis of browsing your website on a mobile device. To learn more about how it works, visit the [methodology page](http://blaze.io/methodology).

This is a beta release of our tool. Expect to see feature additions and improvements in the upcoming months. Follow us on [Twitter](http://twitter.com) for updates and please report any bugs or suggestions via our [feedback module](http://feedback.module).

This tool is powered by the [WebPageTest.org](http://webpagetest.org) platform.

Share This:  

[![Tweet](http://twitter.com)](http://twitter.com) 226  
[![Share](http://facebook.com)](http://facebook.com) 47  
[![Share](http://linkedin.com)](http://linkedin.com) 306
Different Locations

• 3 Locations
  – Ottawa
  – Amsterdam
  – Dulles

• Sponsored Non-Ottawa Locations
  – Aaron Peters
  – Patrick Meenan (WebPageTest)

• Interested in hosting a location?
Different Devices
Measures Page Load

• Measures Load Time & Page Size
  – Supports Video Visualization

• Calculates Load Time Percentiles
  – Based on past results, per device
Details Results Per Run

- Supports Multiple Runs
- WPT Waterfalls
- Detailed HAR Viewer
How does it work?

• **Mobile WebPageTest Agents**
  – Custom apps, created for each platform
  – Poll WPT to receive jobs
  – Load pages while monitoring activities
  – Package and upload results
  – Supports multiple runs, first/repeat view & video

• **Private Modified WPT Instance**
  – Supports different results format

• **Runs on real devices**
Current Limitations

• **Uses Embedded Browser**
  – iOS: Lacks MobileSafari’s JS Engine, possibly more
  – Android: So far no known differences

• **Measurements done over WiFi**
  – Technology supports 3G
  – Not available through Hosted Service yet

• **Feature Gap from full WPT**
Methodology

For Mobile Device Bakeoff
Data Collection

• Measured Alexa Top US 500
  – Global Top Sites included many repetitions...

• Measured 3 Times, 3 Runs Each
  – Used Average of Median Runs

• Measured During Night
  – Helps compare devices, reduces variability

• Leveraged HTTP Archive Database Schema
  – Helped results analysis
## Compared Devices - Specs

<table>
<thead>
<tr>
<th>Device</th>
<th>Type</th>
<th>OS</th>
<th>CPU Speed</th>
<th>Connections Per Domain</th>
<th>Max connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>iPhone 4</td>
<td>Phone</td>
<td>iOS 4.3.3</td>
<td>1Ghz (underclocked)</td>
<td>6</td>
<td>35</td>
</tr>
<tr>
<td>iPad 1</td>
<td>Tablet</td>
<td>iOS 4.3.3</td>
<td>1Ghz</td>
<td>6</td>
<td>35</td>
</tr>
<tr>
<td>iPad 2</td>
<td>Tablet</td>
<td>iOS 4.3.3</td>
<td>2 x 1Ghz</td>
<td>6</td>
<td>35</td>
</tr>
<tr>
<td>Nexus S</td>
<td>Phone</td>
<td>Android 2.3.3</td>
<td>1Ghz</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>XOOM</td>
<td>Tablet</td>
<td>Android 3.0</td>
<td>2 x 1Ghz</td>
<td>6</td>
<td>35</td>
</tr>
<tr>
<td>Blackberry Torch</td>
<td>Phone</td>
<td>Blackberry 6</td>
<td>624Mhz</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>
Statistics
Average Number of Requests

### Average Number of Requests

<table>
<thead>
<tr>
<th>Device</th>
<th>Other</th>
<th>Image</th>
<th>CSS</th>
<th>JS</th>
<th>HTML</th>
</tr>
</thead>
<tbody>
<tr>
<td>iPhone</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>iPad</td>
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<td></td>
</tr>
<tr>
<td>iPad2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nexus S</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>XOOM</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>IE8</td>
<td></td>
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</tr>
</tbody>
</table>
Android & iPhone Awareness

• iPhone vs. IE8: 42% of sites iPhone Aware*
• Nexus-S vs. IE8: 38% of sites Android Aware*
• Mobile Awareness High
  – At least in Top 500 Sites
  – Effectively Equal
  iPhone/Android Awareness

* Aware: At least 30 Requests delta
Tablet Awareness XOOM & iPad

**Alexa 500 Sites**
- iPad: 3% Mobile Sites, 97% Full Sites
- XOOM: 32% Mobile Sites, 68% Full Sites

**200 Sites with Mobile Version**
- iPad: 8% Mobile Sites, 92% Full Sites
- XOOM: 16% Mobile Sites, 84% Full Sites
Addictinggames.com

XOOM

iPad 2
• Some sites pass the decision to the user
Some sites can’t make up their mind…
iPad vs. iPhone: Apples To Apples

- Comparing pages with same content
  - Same URL, similar # requests

- Results:
  - iPad 6% faster than iPhone 4
  - iPad2 25% faster than iPhone 4
  - iPad2 20% faster than iPad 1
XOOM vs. Nexus-S: Androids to Androids

• Comparing pages with same content
  – Same URL, similar # requests

• Impact of newer devices:
  – XOOM 25% faster than Nexus S
iPhone 4 experience faster than iPad 2
Smaller sites trump better hardware
Blackberry

- Data based on Blackberry Torch
  - Running Blackberry 6 with WebKit Browser
- Results still preliminary
  - Not tested like iOS & Android agents
  - Various known issues, more unknown
- Uses Embedded Browser ("BrowserFields")
  - RIM confirmed it should match native browser
• **Blackberry MUCH slower**
  
  – Median load time 7.7s compared to 2.2s and 3.5s on other platforms, despite similar sites
  
  – Gap too big to be explained by weaker CPU
Blackberry Anomalies

• **Average page size bigger** – 510K vs. 370K
  – For same number of requests

• **Some resources are returned uncompressed**
  – We’re using WiFi, maybe it expects BES Server?
  – Still working on validating finding

![Average Total Bytes](chart.png)
Analysis – What Drives Speed?
Requests vs. Bytes vs. Domains

- Each calculated after “neutralizing” others
- # Requests main slowdown
  - Not the same in IE8
  - Likely worse on 3G, where latency is higher
- # bytes only significant for iOS
  - iPad2 minimized impact compared to iPad1
- # Domains insignificant on stronger devices
Independent Correlation, By Type

![Bar chart showing correlation between device type and various request types and byte sizes.]

- **HTML Reqs**
- **JS Reqs**
- **CSS Reqs**
- **Image Reqs**
- **HTML Bytes**
- **JS Bytes**
- **CSS Bytes**
- **Image Bytes**

Device types include:
- Nexus S
- XOOM
- iPad
- iPad2
- iPhone
- IE8

The chart illustrates the correlation of request types and byte sizes across different devices, providing insights into how device types influence resource requirements.
Correlation By Type – Key Insights

• Total Image Requests 2\textsuperscript{nd} biggest factor

• Image Bytes significant on machines with weaker graphics
  – iPad1 & IE8 on test machine with old video card

• JS Bytes Significant across iOS & Nexus-S
  – Not in XOOM or IE8
  – JS Requests only significant in iPhone & iPad 1

• CSS Requests & CSS Bytes Insignificant
  – Might be significant to render time, but not load time
Conclusions & Recommendations
Tips for Website Owners

• Reduce Total Requests
• Reduce Image Requests
• Deprioritize CSS Optimization
  – At least for load time purposes
• Reduce JS Bytes
  – Consider Older Devices will be around for a while
• Look out for Android Tablets
  – Honeycomb 3.0 is indicated in user-agent
Tips for Browsers & Device Makers

• Google: Help Sites Identify Android Tablets
  – Much harder to do than for iPhone
  – Impacts user-experience for Tablet user

• Improve browsers to speed up older devices
  – They’ll be here for a while...
Summary

• This study is the first of many
  – New technology helped get deeper insights
  – Needs to be improved: more sites, deeper tech, more 3G, more devices...

• Some insights were obvious, some won’t
  – We expected JS Impact, but not Image impact

• Experiments should confirm conclusions
  – Was outside the scope of this presentation...
For More Information

- **Mobitest:**
  - [www.blaze.io/mobile](http://www.blaze.io/mobile)

- **Detailed blog post:**
  - [www.blaze.io/blog](http://www.blaze.io/blog)
Questions?