

Going Fast on the Mobile Web

by Jason Grigsby

Flickr: Uploaded February 11, 2007 by hawridger

Work: <http://cloudfour.com> • Blog: <http://userfirstweb.com> • Twitter: @grigs
Mobile Concurrency Test: <http://cloudfour.com/mobile/>

Cloud Four



The Mobile Web is Coming.
Web Developers aren't Ready.

Flickr photo by look4u: <http://www.flickr.com/photos/look4u/279668622/>

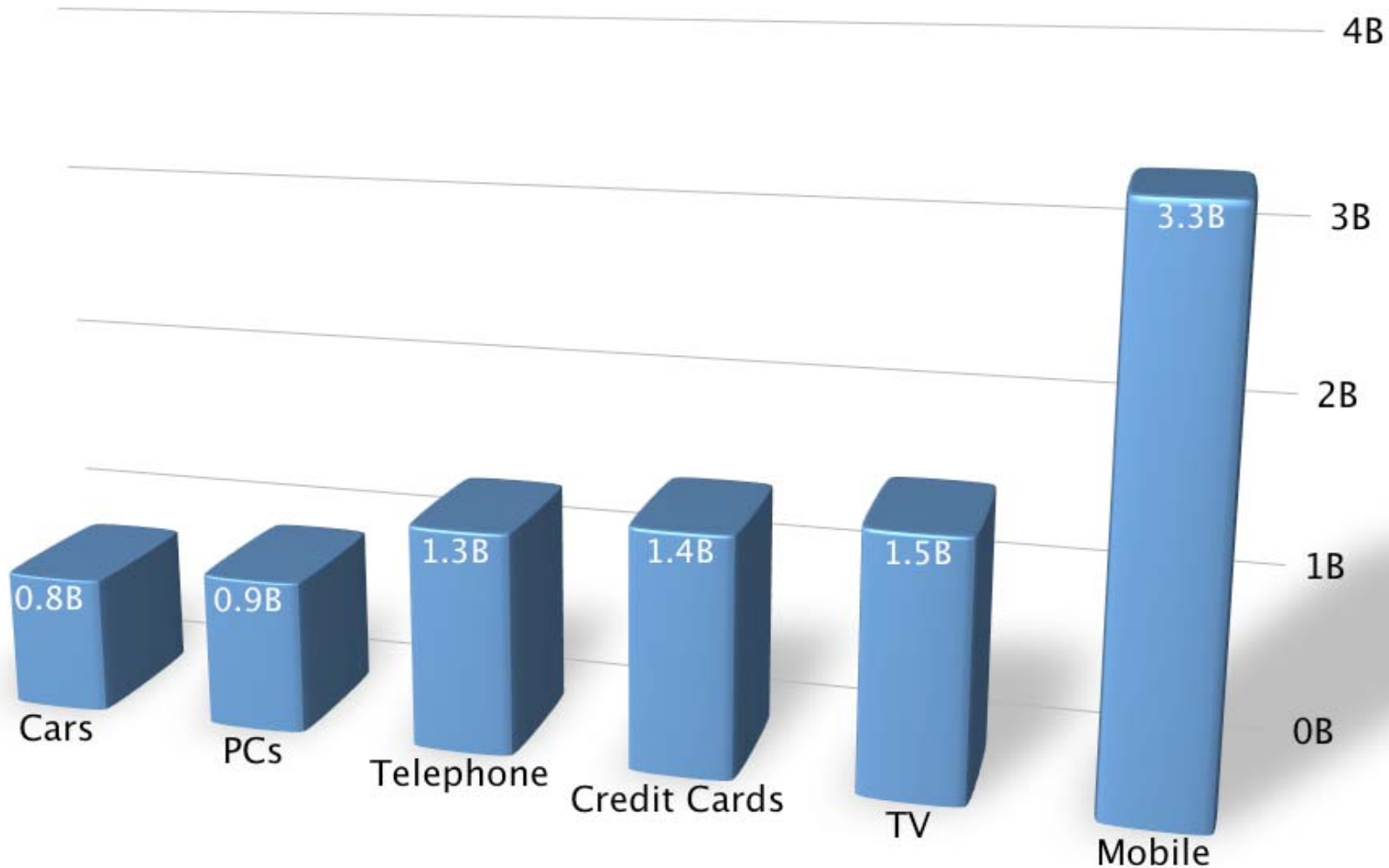


3.3
Billion

Mobile phone for
half the planet.

Flickr photo by Pingnews: <http://www.flickr.com/photos/pingnews/370061022/>

3.3 Billion in Perspective



Source: http://communities-dominate.blogs.com/brands/2007/01/putting_27_bill.html
<http://communities-dominate.blogs.com/brands/2008/01/when-there-is-a.html>

2007 SMS Revenue: **100 billion**

Combined

- Box Office
- DVD Sales & Rentals
- Music Industry
- Video Games

Flickr photo by Vlastula: <http://www.flickr.com/photos/vlastula/450642954/>

200 billion for data services in 2008

(SMS accounts for 130B)

The background of the slide is a photograph of the Hollywood sign, which consists of large white letters spelling 'HOLLYWOOD' on a hillside. The sign is partially obscured by the text and list overlaid on the image.

Combined

- Box Office
- DVD Sales & Rentals
- Music Industry
- Video Games

Mobile is the Technology that Cried Wolf. (for 15 years)



Flickr photo by CaptPiper: <http://www.flickr.com/photos/piper/197153406/>


The Executive Computer; 'Mother of All ...ream Driven by Greed'? - New York Times

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The New York Times
Wednesday, February 13, 2008

Technology

WORLD U.S. N.Y. / REGION BUSINESS TECHNOLOGY SCIENCE HEALTH SPORTS OPINION



The Executive Computer; 'Mother of All Markets' or a 'Pipe Dream Driven by Greed'?

By PETER H. LEWIS
Published: July 19, 1992

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🖨 PRINT
💾 SAVE
🔗 SHARE

Sometime around the middle of this decade no one is sure exactly when -- executives on the go will begin carrying pocket-sized digital communicating devices. And although nobody is exactly sure what features these personal information gizmos will have, what they will cost, what they will look like or what they will be called, hundreds of computer industry officials and investors at the Mobile '92 conference here last week agreed that the devices could become the foundation of the next great fortunes to be made in the personal computer business.

"We are writing Chapter 2 of the history of personal computers," said Nobuo Mii, vice president and general manager of the International Business Machines Corporation's entry systems division.

How rich is this lode? At one end of the spectrum is John Sculley, the chief executive of Apple Computer Inc., who says these personal communicators could be "the mother of all markets."

At the other end is Andrew Grove, the chairman of the Intel Corporation, the huge chip maker based in Santa Clara, Calif. He says the idea of a wireless personal communicator in every pocket is "a pipe dream driven by greed."

These devices are expected to combine the best features of personal computers, facsimile machines, computer networks, pagers, personal secretaries, appointment books, address books and even paperback books and pocket CD players -- all in a hand-held box operated by pen, or even voice commands.

“The Mother of all Markets.”

Dr. Eli Harai, San Disk
CEO, 2008

John Sculley, Apple
CEO, 1992

<http://query.nytimes.com/gst/fullpage.html?res=9E0CE5D9143AF93AA25754C0A964958260>


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BUSINESS TECHNOLOGY; Doubts Raised on ...er of Internet Users – New York Times

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The New York Times
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BUSINESS TECHNOLOGY; Doubts Raised on Number of Internet Users

By PETER H. LEWIS
Published: August 10, 1994

Has the Internet been overhyped?

Even as cyberspace is being touted as the hippest place to congregate since the original Woodstock, some experts now contend that estimates of the number of people actively using the Internet web of computer networks may be grossly exaggerated.

There is still widespread agreement that the growth of the Internet, and the number of people using it, is exponential; it is seen doubling in size every year. But some network experts say the most commonly cited numbers -- 20 million to 30 million users worldwide -- may be many times too high.

"Suppose there were really only two million or three million," said John S. Quarterman, a highly regarded Internet demographer in Austin, Tex.

In an assessment potentially chilling to all the businesses betting millions of dollars on the premise that they can sell advertising, information and products to the Internet masses, Mr. Quarterman believes that his lower numbers may be a more accurate count of people who are active and reachable on the computer network.

The latest comprehensive survey that tries to estimate the Internet's reach discovered more than 3.2 million "host" computers capable of communicating directly with other computers on the Internet. The data, released late last week by Mark K. Lottor of the consultants Network Wizards of Menlo Park, Calif., marked a stunning increasing of one million additional machines since the survey was last taken in January.

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Mobile Web: So Close Yet So Far – New York Times

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Browse Products
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**PROTOTYPE
Mobile Web: So Close Yet So Far**

By MICHAEL FITZGERALD
Published: November 25, 2007

ON the surface, the mobile Web is a happening place. There's the [iPhone](#) in all its glory. More than 30 companies have signed up for the Open Handset Alliance from [Google](#), which aims to bring the wide-open development environment of the Internet to mobile devices. [Nokia](#), which owns nearly 40 percent of the world market for cellphones, is snapping up Web technology companies and has made an eye-popping \$8.1 billion bid for [Navteq](#), a digital mapping service. There are also the requisite start-ups chasing the market.

Enlarge This Image



Cellphones with Zumobi software, left, and Yahoo Go. For years, companies have offered mobile surfing services, but many people are not using them.

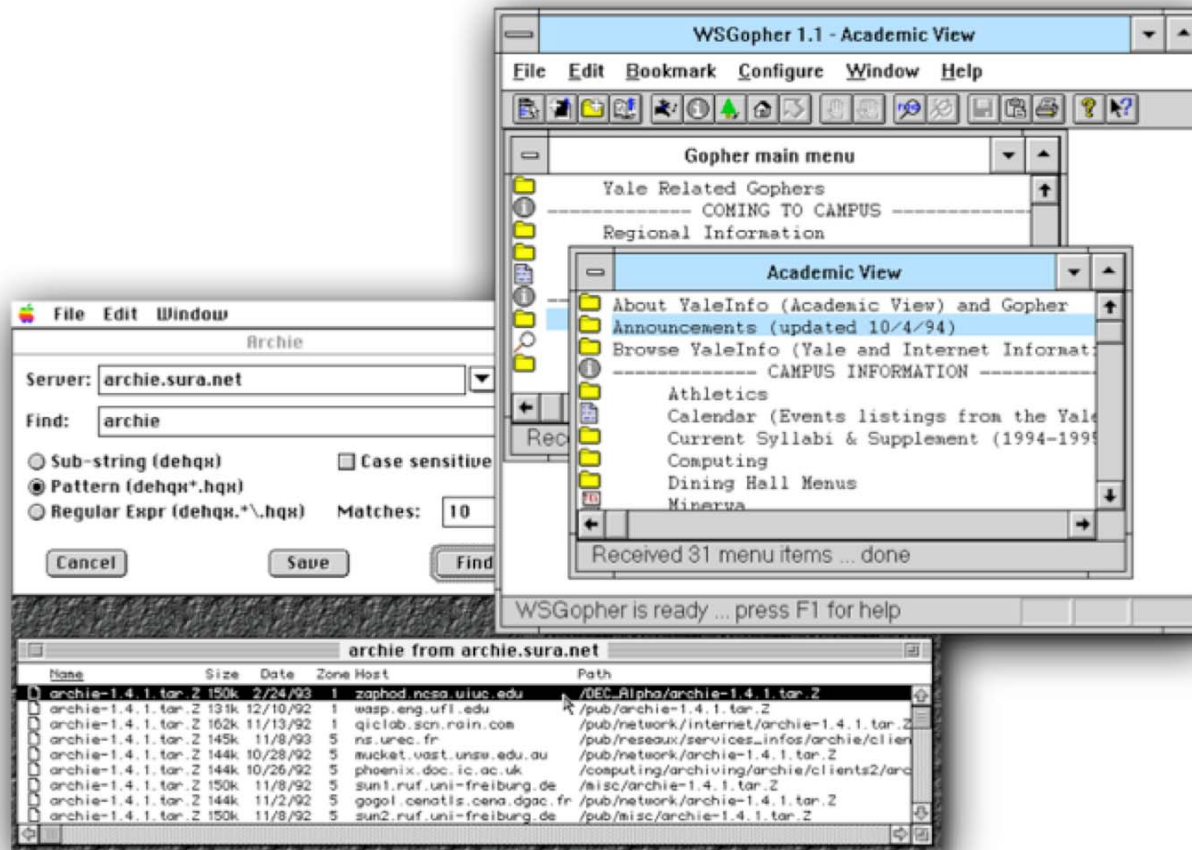
It all looks good, but the wireless communications business smacks of a soap opera, with disaster lurking like your next dropped call.

In 2000, the wireless application protocol was supposed to bring the Internet to the cellphone. Our hero turned out to be a flash in the pan. That was attributed to a lack of high-speed cellular data networks, so a frenzied and costly effort to build third-generation, or 3G, networks ensued. But at a recent conference, 3G was called "a failure" by Caroline Gabriel, an analyst at Rethink Research. She said data would make up only 12 percent of average revenue per user in 2007, far below the expected 50 percent. (The 12 percent

E-MAIL
PRINT
REPRINTS
SAVE
SHARE

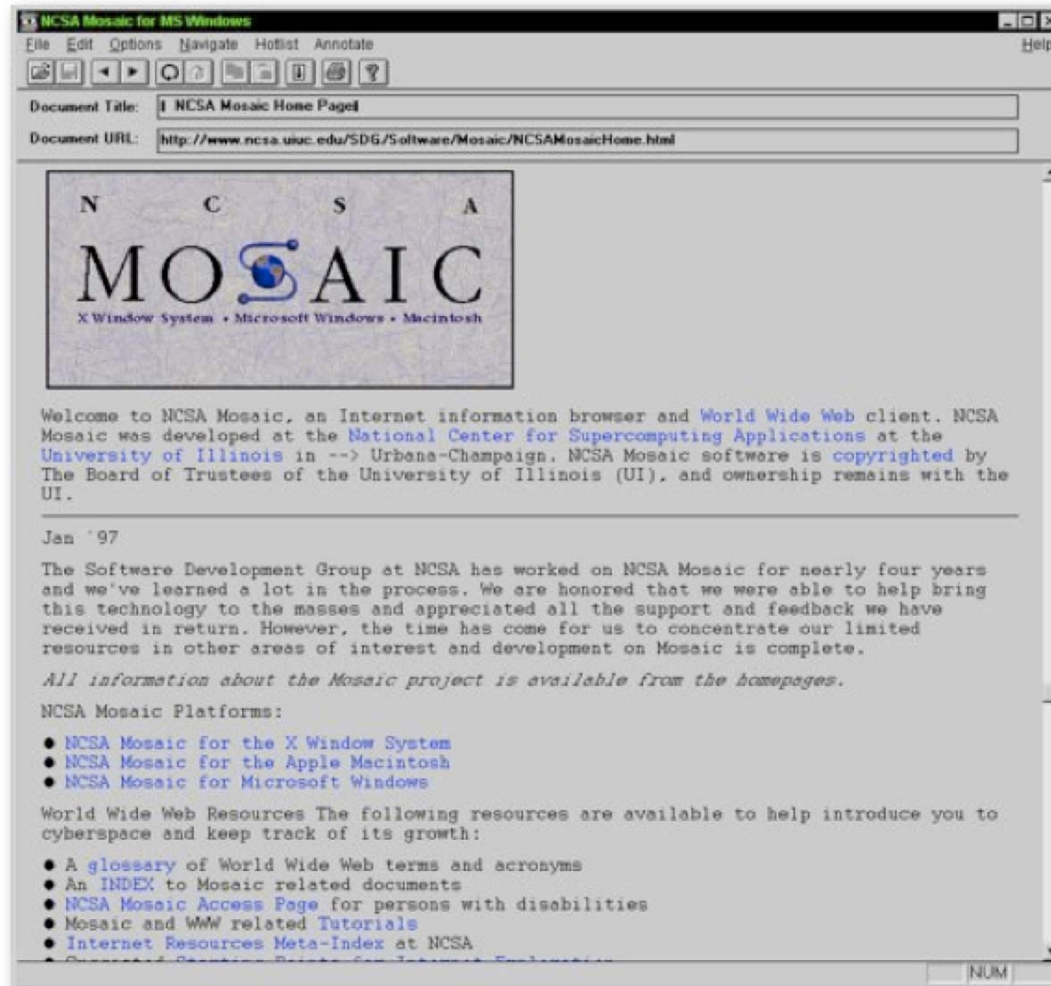
ARTICLE TOOLS SPONSORED BY
YOUVA

Gopher, Mosaic, WAP, iPhone



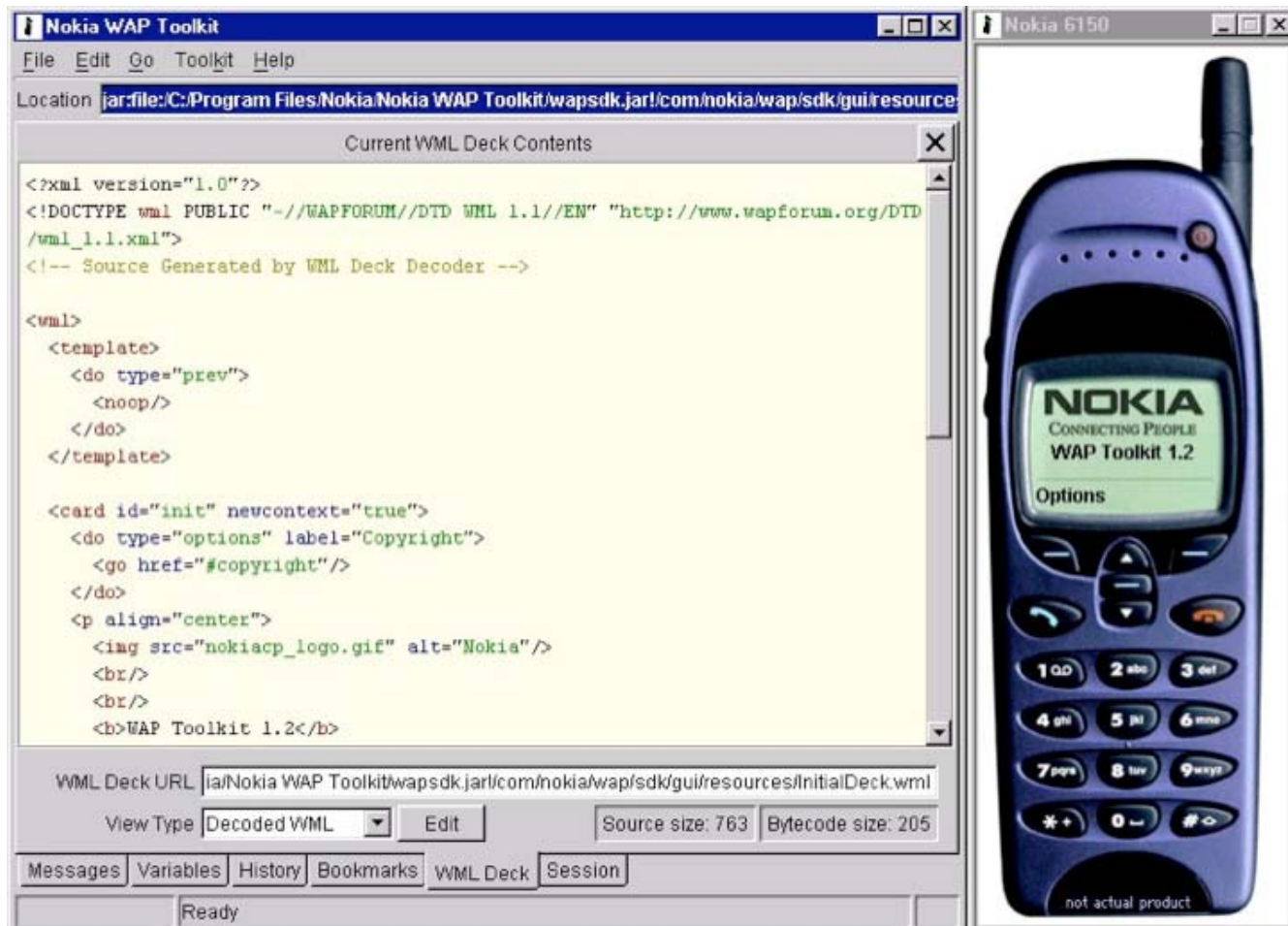
Flickr photo by: <http://www.flickr.com/photos/vixon/352427852/>

Gopher, Mosaic, WAP, iPhone



Flickr photo by: <http://www.flickr.com/photos/vixon/352427852/>

Gopher, Mosaic, WAP, iPhone



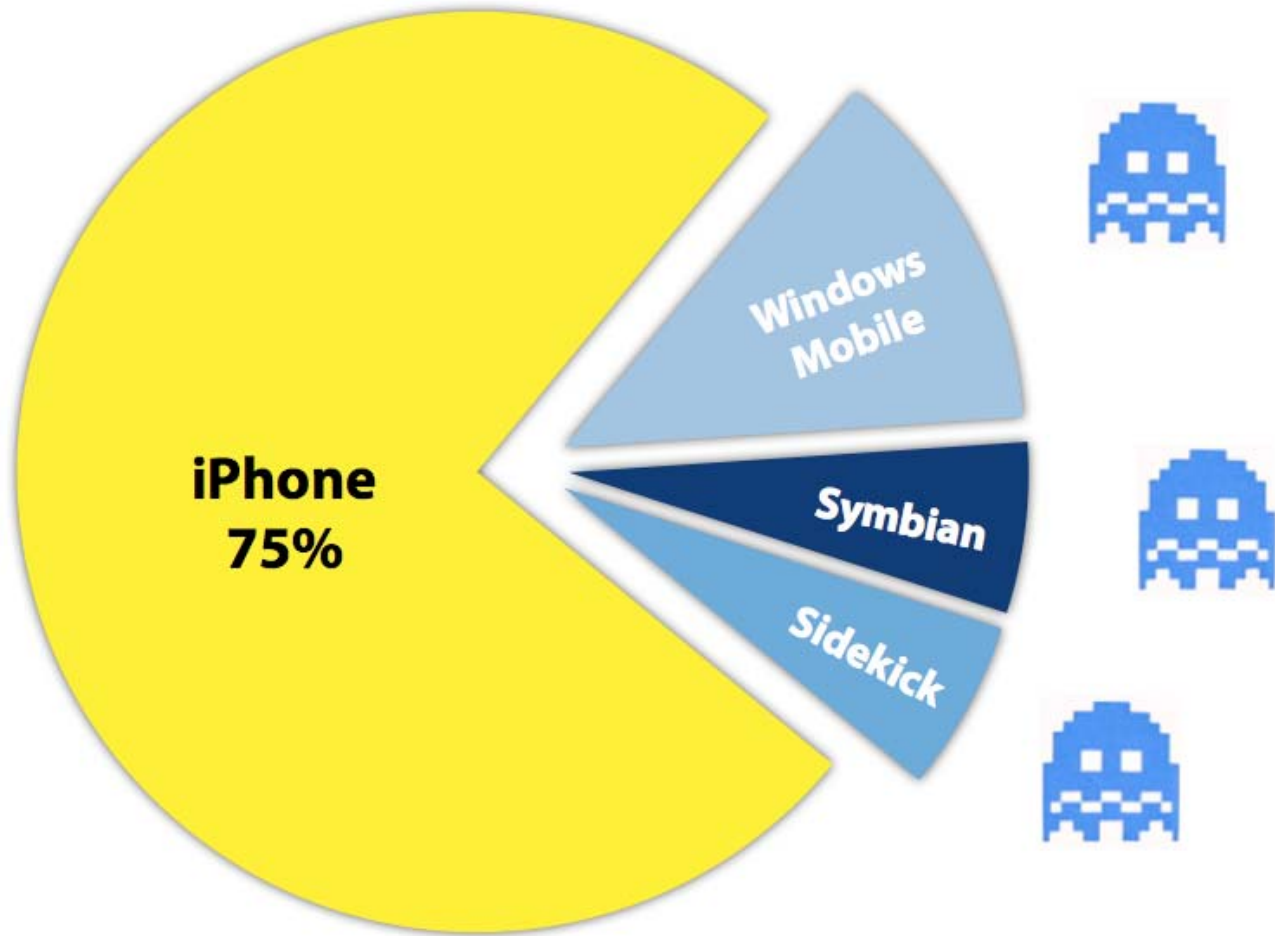
Flickr photo by: <http://www.flickr.com/photos/vixon/352427852/>

Gopher, Mosaic, WAP, iPhone



Flickr photo by: <http://www.flickr.com/photos/vixon/352427852/>

U.S. Mobile Browser Share



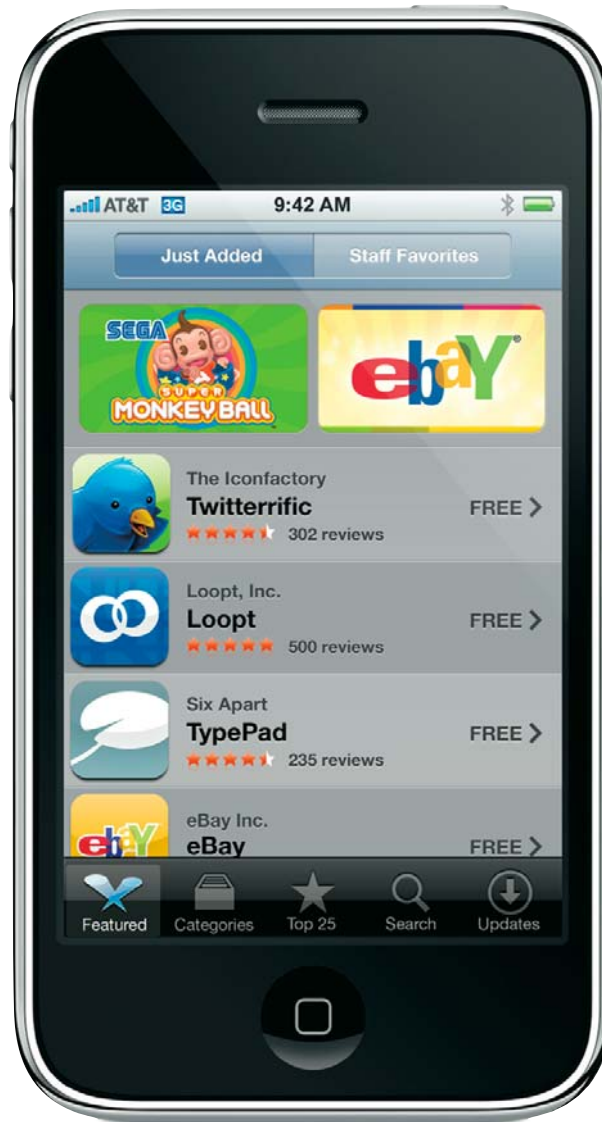
Source: NetApplications, August 2008
Graphic courtesy Raven Zachary, <http://raven.me>

“It’s about usage. Not units”

- Number of queries on **Google search from iPhones surpassed those from Symbian-based phones** in the days after Christmas. Nokia’s Symbian-based phones are 40% of the market worldwide.
- German iPhone users consume **30 times more data**.
- **95%** of iPhone customers **regularly surf the Internet**. Data services revenue increased from \$2.7 billion in 2005 to **\$6.9 billion** in 2007.
- Google sees **50 times the number of searches** using the iPhone than any other mobile device. They were so surprised, they asked their engineers to check the logs to make sure it was correct.
- This is why major companies, Google, Quicken, etc. are all **launching iPhone-optimized services** despite the iPhone’s 1% market share.



App Store



App Store Revenue Estimates (07/13/08)

Application	Price (USD)	Revenue Estimate
Super Monkey Ball	\$9.99	\$4,915,019
ForeFlight Mobile	\$69.99	\$3,443,465
OmniFocus	\$19.99	\$1,899,164
Nester's Anatomy Flash Cards	\$39.99	\$1,696,107
LionClock Plus	\$79.99	\$1,628,466
Enigmo	\$9.99	\$1,271,126
Band	\$9.99	\$1,101,642
Ultalingua Spanish Dictionary	\$29.99	\$661,426
Bejeweled 2	\$9.99	\$627,089
Sketches	\$5.99	\$589,409

Source: Medialets

<http://tinyurl.com/medialetsappstorerev>



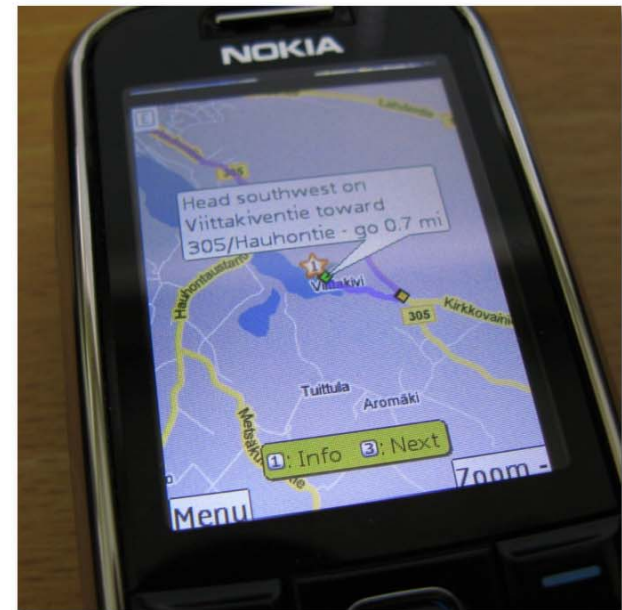
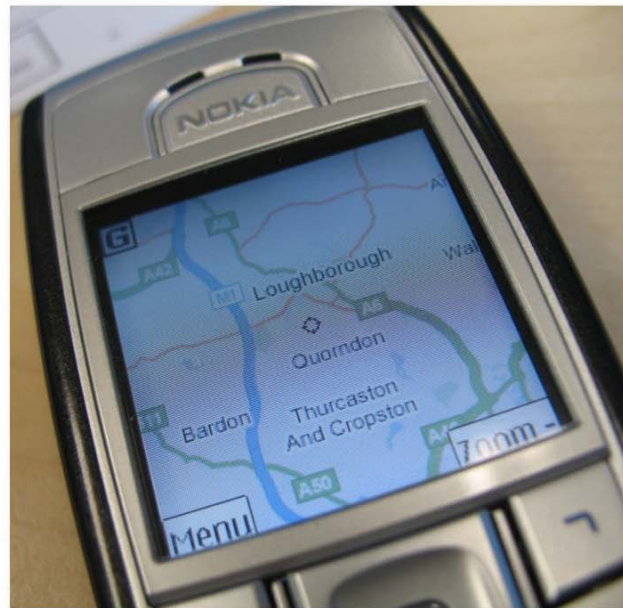


Cloud Four



Google Mobile – App Challenges

- Pressure from Eric Schmidt for rapid releases
- 10+ platforms to support
- Over 100 different builds
- Better way = same as desktop – Mobile Web



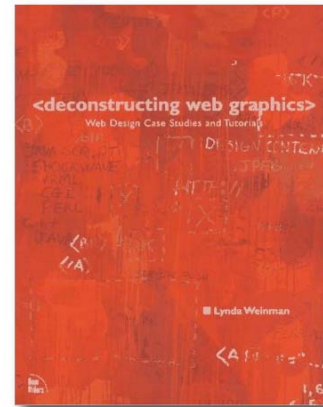
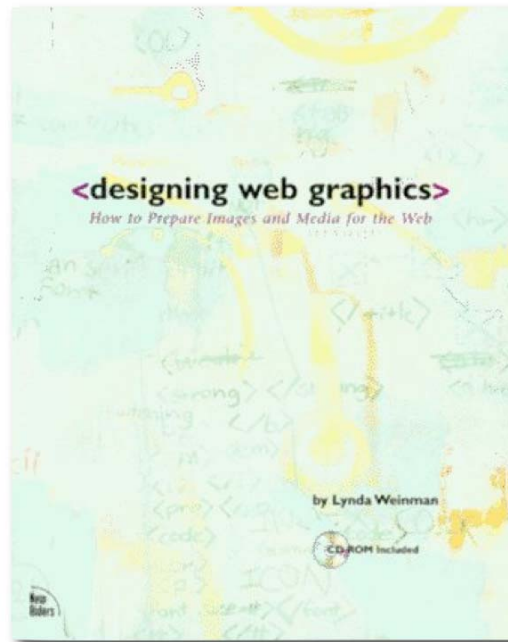
<http://www.flickr.com/photos/83731031@N00/445924458/> • <http://www.flickr.com/photos/mcdave/142758127/>
<http://www.flickr.com/photos/nataliejohnson/290541732/>

Why We're Not Ready to Ride the Mobile Wave

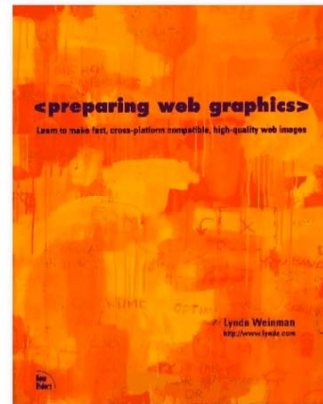


Flickr photo by .Hessam: <http://www.flickr.com/photos/essamo/1070527547/>

1996
258
pages

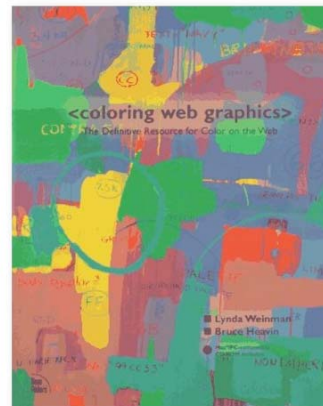
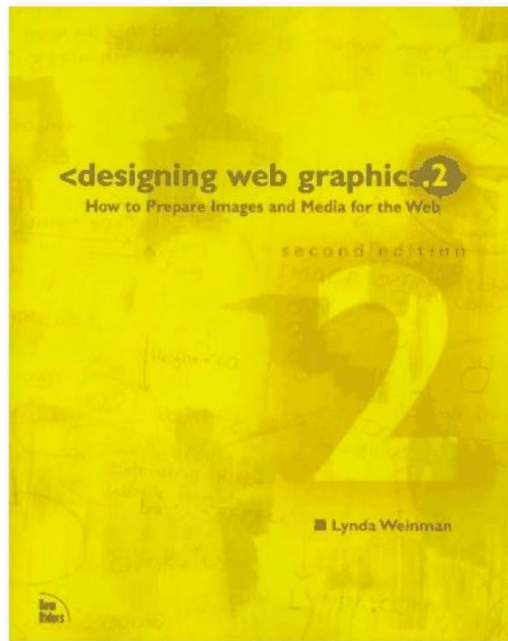


1996
235
pages



1997
238
pages

1997
447
pages



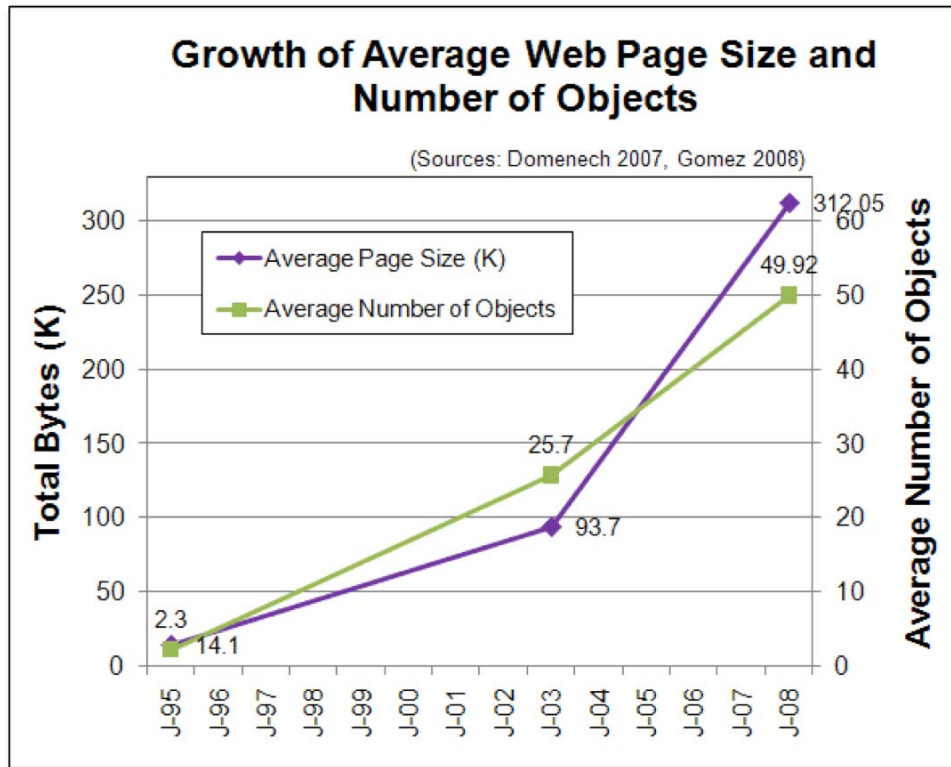
1997
235
pages

We've Left Optimization Behind



Flickr photo by mfajardo: <http://www.flickr.com/photos/mfajardo/396104047/>

We've Become Bandwidth Gluttons



Since 2003:

- Web Page Size **Tripled**
- # of Objects **Doubled**

Since 1995:

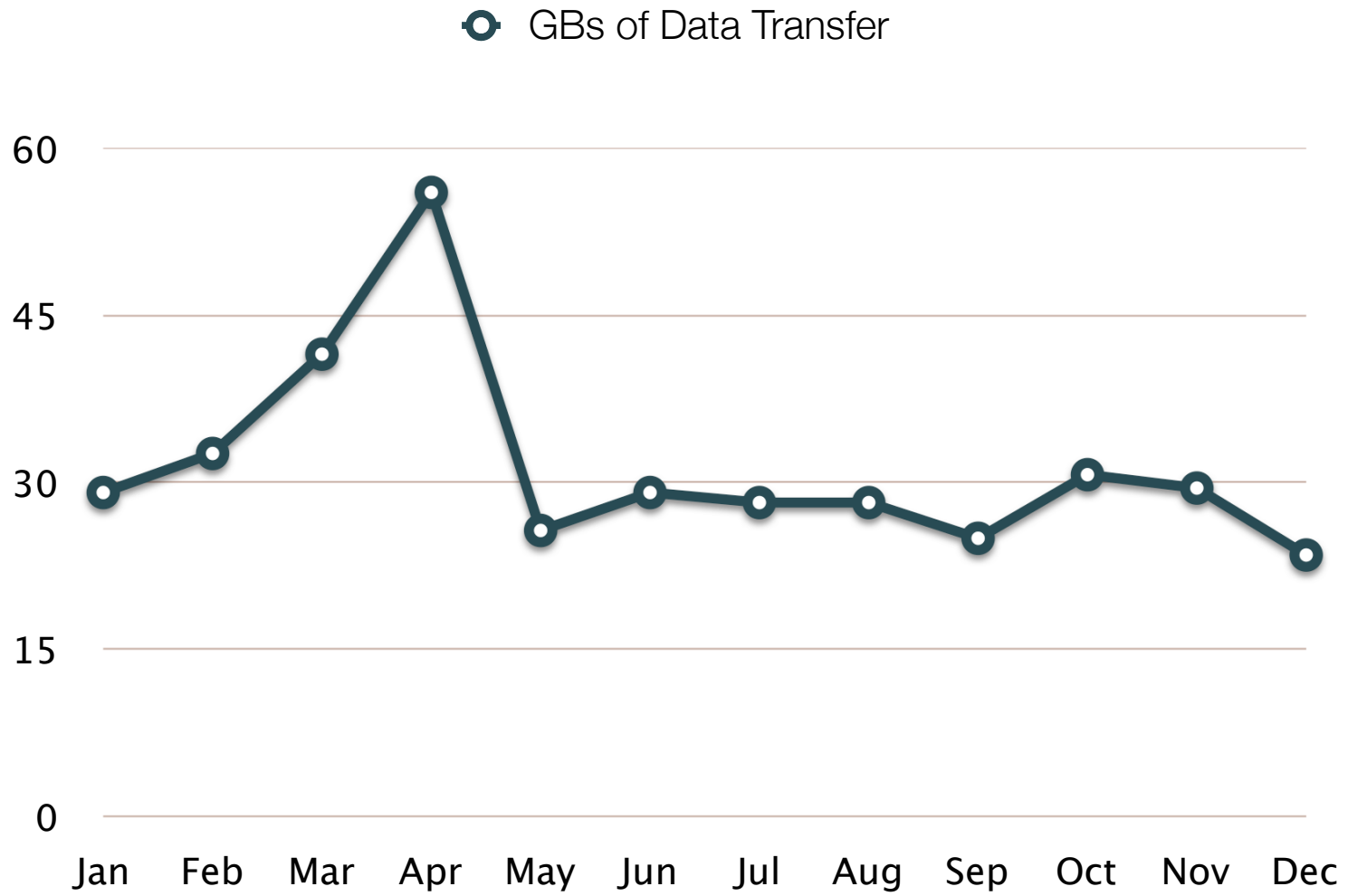
- Web Page Size: **22x**
- # of Objects: **21x**

Source: <http://www.websiteoptimization.com/speed/tweak/average-web-page/>

2003: Business Critical Look at Speed

- Customer complaints
- Limits of our 3 T-1s near
- Months away from new data center





75% faster page loads

7 months in data center



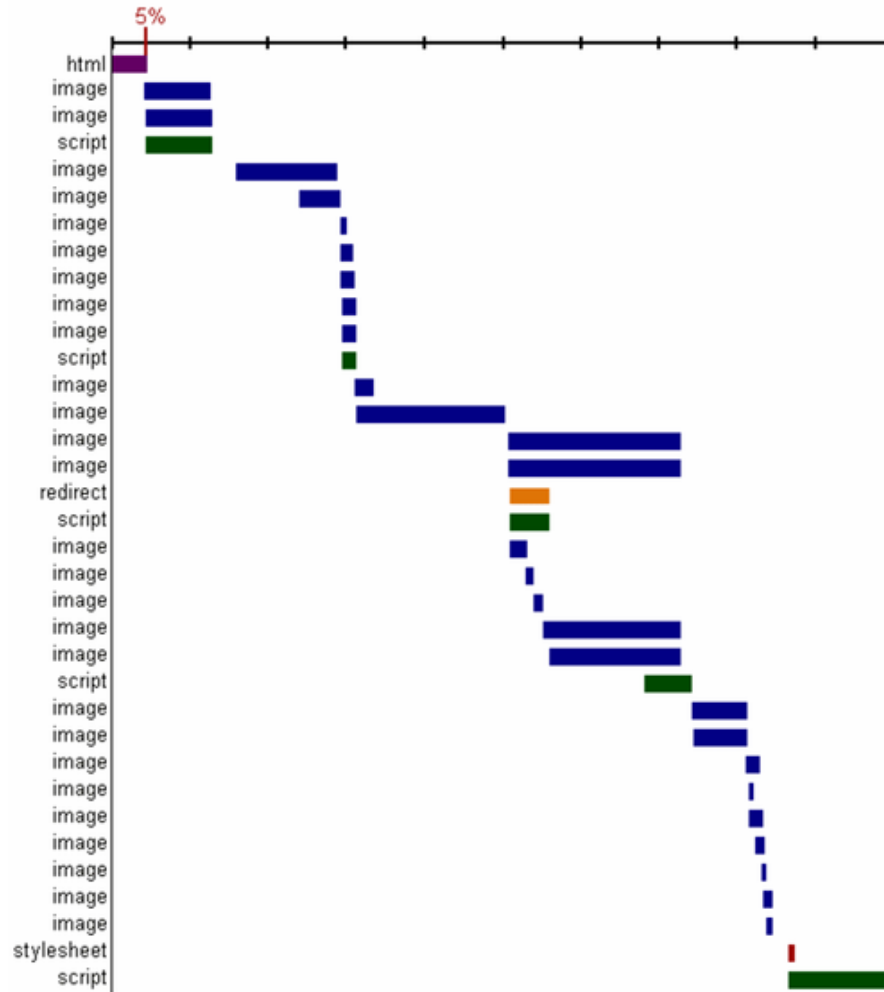
Optimizing for Flow

0.1 seconds —
Viewed as
Instantaneous

1.0 seconds —
Moving Freely

10 seconds —
Retain Focus on
Task

Yahoo!'s 80/20 Rule



Source: <http://yuiblog.com/blog/2006/11/28/performance-research-part-1/>

Yahoo!'s 14 Performance Rules (Now 34!)

- 1. Make Fewer HTTP Requests**
2. Use a Content Delivery Network
3. Add an Expires Header
- 4. Gzip Components**
5. Put Stylesheets at the Top
6. Move Scripts to the Bottom
7. Avoid CSS Expressions
8. Make JavaScript and CSS External
9. Reduce DNS Lookups
10. Minify JavaScript
11. Avoid Redirects
12. Remove Duplicate Scripts
13. Configure ETags
14. Make AJAX Cacheable

Source: <http://developer.yahoo.com/performance/rules.html>

GZIP Compression

- If you do nothing else, DO THIS!
- GZIP can reduce files and download time up to 75%.
- Works on HTML, CSS, Javascript, XML and JSON files
- Most browsers handle GZIP correctly and the libraries like mod_gzip handle exceptions correctly.

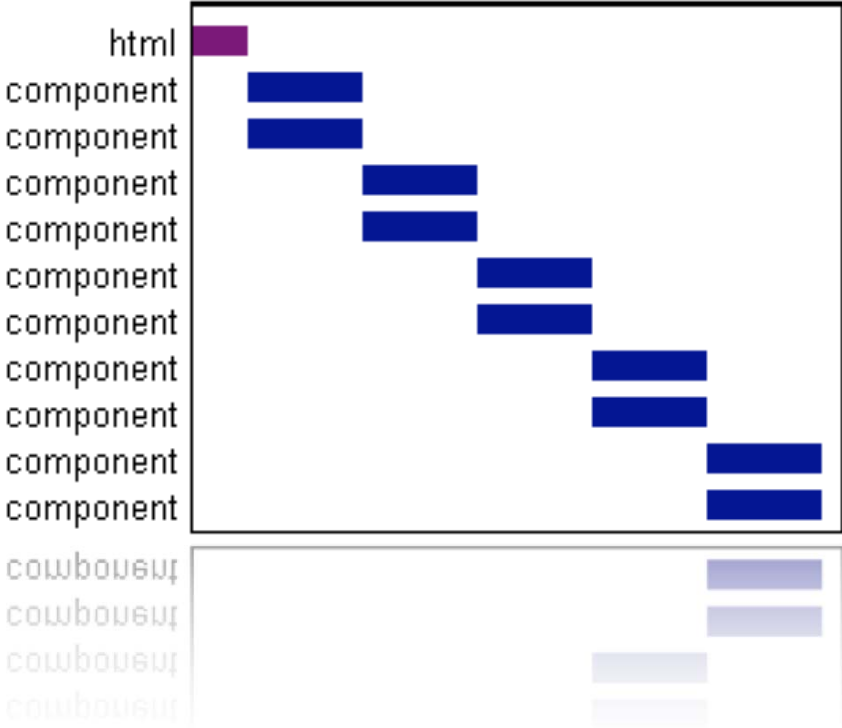
Fewer HTTP Requests

SLOW

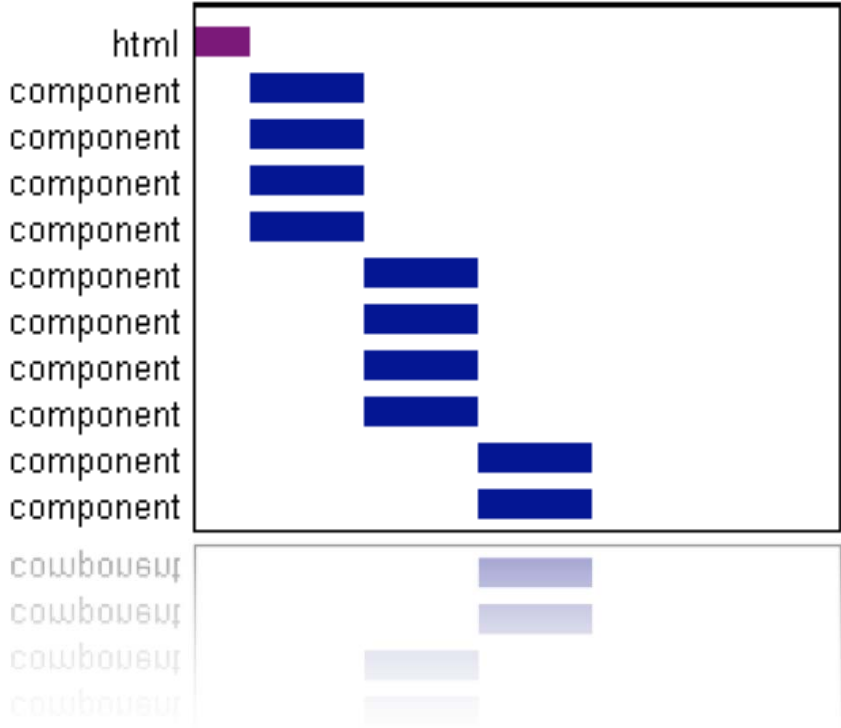
Most browsers only open 2 http connections to one domain at a time.

Parallel HTTP Requests

One Domain



Two Domains



Source: <http://yuiblog.com/blog/2007/04/11/performance-research-part-4>

How do these rules apply to the mobile web?



Numerous Mobile Browsers: Little Documentation

- Access
- Access Netfront
- BlackBerry
- IE Mobile
- Motorola Internet Browser
- Nokia
- Openwave Mobile Browser
- Opera Mini
- Opera Mobile
- Palm
- Safari
- Samsung
- Teleca-Obigo
- WinWAP

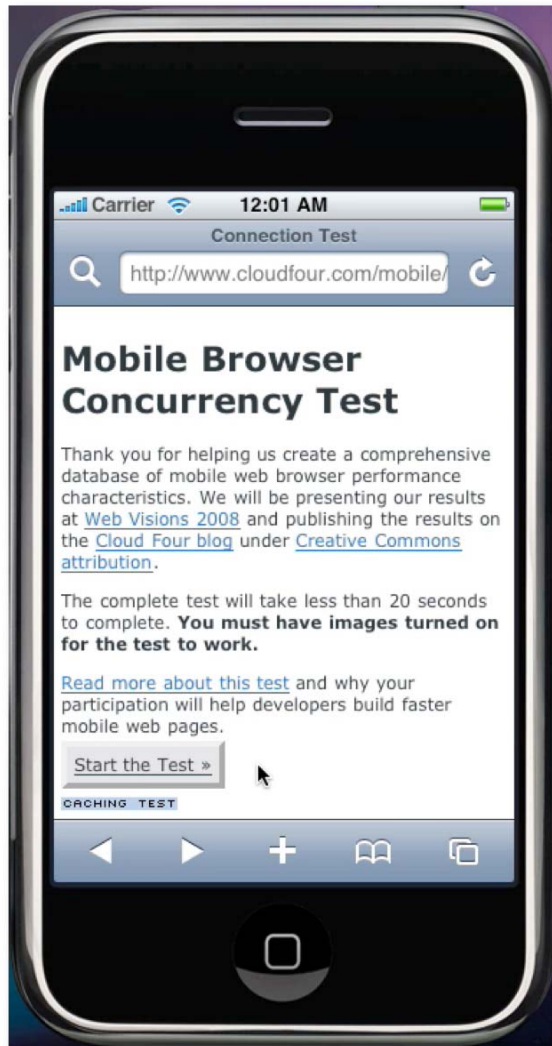
No information on gzip support or # of concurrent connections.

Source: <http://wurfl.sourceforge.net/>

Cloud Four's Mobile Browser Test

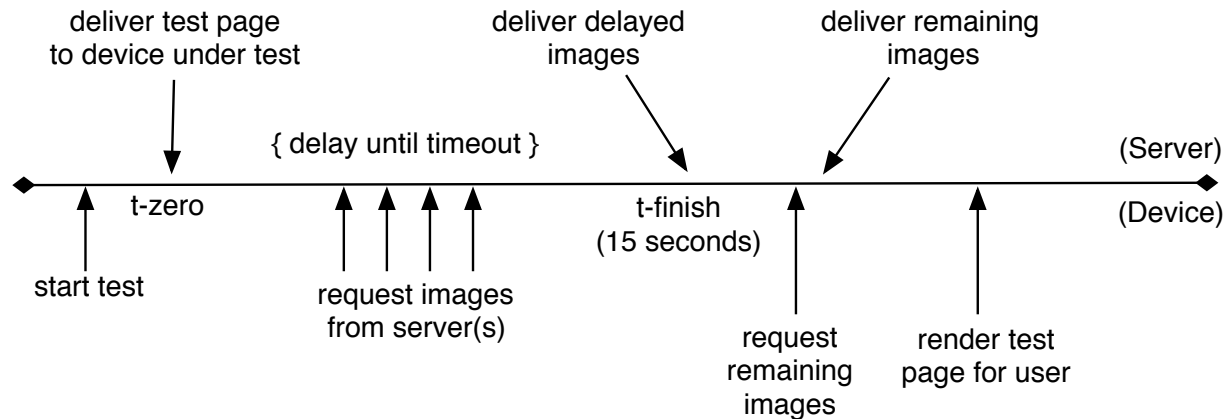
- Tests for number of concurrent connections and multiple domains.
- Looks for GZIP support.
- Looks for caching support.
- Works in any browser (even desktop):
 - No javascript
 - XHTML-MP
- <http://www.cloudfour.com/mobile/>
or simple text MOBILETEST to 41411.

Cloud Four's Mobile Browser Test



- Tests for number of concurrent connections and multiple domains.
- Looks for GZIP support.
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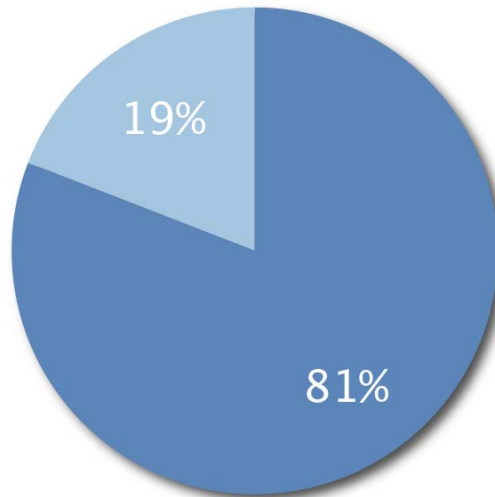
How Does the Test Work?



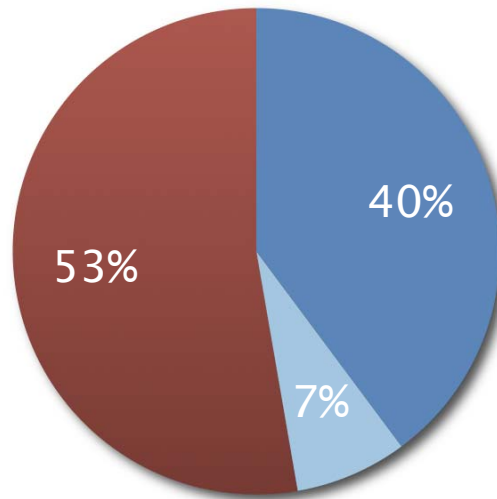
- Generates a unique token for this test
- Records selected HTTP headers for later analysis
- Computes the finish time (microsecond granularity) for the test, based on the current time and our desired delay factor
- Creates a database record for the test, containing: the token, start time, finish time, and zeroed counters for four separate domains
- Generates and delivers the test page containing 64 small (4x4 px) image requests evenly distributed across four separate domains
- Waits for the browser to fetch all images and render the page

Initial Results — Still Looking for More Testers

- GZIP
- No GZIP



- Caching
- No Caching
- Inconclusive



- Over 4,292 tests
- 971 Unique User Agents
- 366 Unique Mobile User Agents
- Fun items like Kindle, PS3, Zune.

Major Mobile Browsers

Browser	GZIP	Caching	Domain1	Domain 2	Domain 3	Domain 4	Total Connections
Android	100%	Unclear	4	0	0	0	4
Blackberry Browser	28%	71%	4	0	0	0	4
MSIE 4.x	100%	80%	3	0	0	0	3
MSIE 5.x	83%	100%	3	0	0	0	3
MSIE 6.x	96%	87%	3	0	0	0	3
Opera Mini 3.x	100%	100%	10	10	10	10	40
Opera Mini 4.x	100%	0%	2	1	1	1	5
Opera Mobile 8.x*	86%	89%	2	2	2	2	8
Safari (iPhone/iPod)	100%	100%	4	4	4	4	16
Symbian (WebKit)	100%	100%	7	0	0	0	7

Other Mobile Browsers

Browser	GZIP	Caching	Domain1	Domain 2	Domain 3	Domain 4	Total Connections
Danger Hiptop	0%	?	3	0	0	0	3
Jataayu	100%	0%	10	0	0	0	10
NetFront 3.x	87%	100%	1 to 4	0	0	0	1 to 4
Nokia Browser	100%	100%	1 to 7	0 to 5	0 to 1	0 to 1	4 to 12
Obigo	0%	0%	3	0	0	0	3
Open Wave Mobile 6.2	100%	0%	4	0	0	0	4
Palm Blazer	71%	50%	4	0	0	0	4
SEMC Browser	100%	?	2	2	2	2	8
UP.Browser	50%	100%	1 to 4	0	0	0	1 to 4
Zune	100%	100%	16	16	16	16	64

Preliminary Conclusions from Our Tests

- GZIP support is much better than we anticipated.
- Either caching is more inconsistent than we anticipated or we need to change the test.
- Full 3G speeds will only come for Windows Mobile and Blackberries after they address their browser deficiencies (concurrent connections, rendering engines and processor speed).
- Lots of variability between browsers means necessary testing.
- Still much to learn about mobile browser performance

Eight Recommendations for All Mobile Devices

1. Turn on GZIP Compression

5. Simple, Valid Markup

2. Fewer Files

6. Reduce DNS Lookups

3. Aggressively Encourage Caching

7. Avoid Redirects

4. Minimize File Sizes

8. Limit Cookies

Likely benefit from all 34 Yahoo! guidelines.
<http://developer.yahoo.com/performance/rules.html>

Flickr photo by amaneiro:
[http://www.flickr.com/
photos/amaneiro/
2396649106/](http://www.flickr.com/photos/amaneiro/2396649106/)

**Compressed, but
fully functional.**

**#1
GZIP**

2. Fewer Files

- HTTP Connections are expensive
- No more than 1 external CSS & 1 external JS
- Consider embedding CSS & JS unless you are confident about your caching.
- Remove any unnecessary files (print css)
- If CSS is supported, use CSS sprites.
- Consider inline images using data url

2. Fewer Files: Inline Images

```

```

```
background:url(data:image/gif;base64,R0lGODlhEAAOALMAAOazToeHh0tLS/7LZv/0jvb29t/f3//Ub//ge8WSLf/rhf/3kdbWlmxsbP//mf///yH5BAAAAAALAAAAAQAA4AAARE8L1Ekyky67QZ1hLnjM5UUde0ECwLJoExKcppV0aCcGCmT IHEIUEqjgaORCMxIC6e0CcguWw6aFjsVMkkIr7g77ZKPJjPZqIyd7sJAgVGoEGv2xsBxqNgY Pj/gAwXEQA7) top left no-repeat; )
```



Test extensively. Not supported in all browsers.

3. Aggressively Encourage Caching

- **Goal #1: No HTTP HEAD Requests.**
- **Add Expires header. Put it far into the future.**
- **Develop naming conventions for versioning of files. Update filename when file is modified.**

e.g., logo080523.png

- **Keep files under 25k for mobile devices.**
- **Configure or remove ETags from files.**
- **Watch your logs to make sure caching works.**

4. Minimize File Sizes

- Three reasons why file size matters:
 - Download time
 - Caching
 - Memory
- Minimize all html, css, & javascript regardless of GZIP.
- Squeeze all unnecessary data out of images.

Remember every bit counts!

5. Simple, Valid Markup

- CSS-based vs. table layouts
Tables are complex to render.
- Separate content, style, behavior
- Less markup overall
- ESPN proved that this change can be significant alone.
- Consider processing time to determine layout in addition to download time.

6. Reduce DNS Lookups

- **Each DNS lookup costs performance. No control over the DNS speed.**
- **Nothing can be downloaded from the domain until the lookup completes.**
- **Optimum is between 2 and no more than 4 domains per web page because of concurrent download benefits.**



7. Avoid Redirects

- Redirects cost the user time so avoid the easy ones. Particularly painful for mobile.
- Permanent 301 redirects should be modified to be cacheable (expires header)
- Put the trailing slash on your links and shave time off of Apache doing the work.

8. Limit Cookies

- Cookies uploaded with every request! Upload rates are much slower than download speeds.
- Goal: **Zero or One Cookie.** Diet time!
- Make the cookie as small as possible. Track details on the server side.
- Use www or other sub-domain and restrict cookies to that domain.
- Move images, css, javascript to another domain where cookies will not be used.



Eight Recommendations for Post iPhone Devices



1. Optimize javascript performance
2. Reduce DOM elements
3. Javascript at bottom of page
4. CSS in the head tag
5. Lazy Load Components
6. Use GET unless you need POST
7. Use JSON instead of XML
8. Use hardware accelerated effects

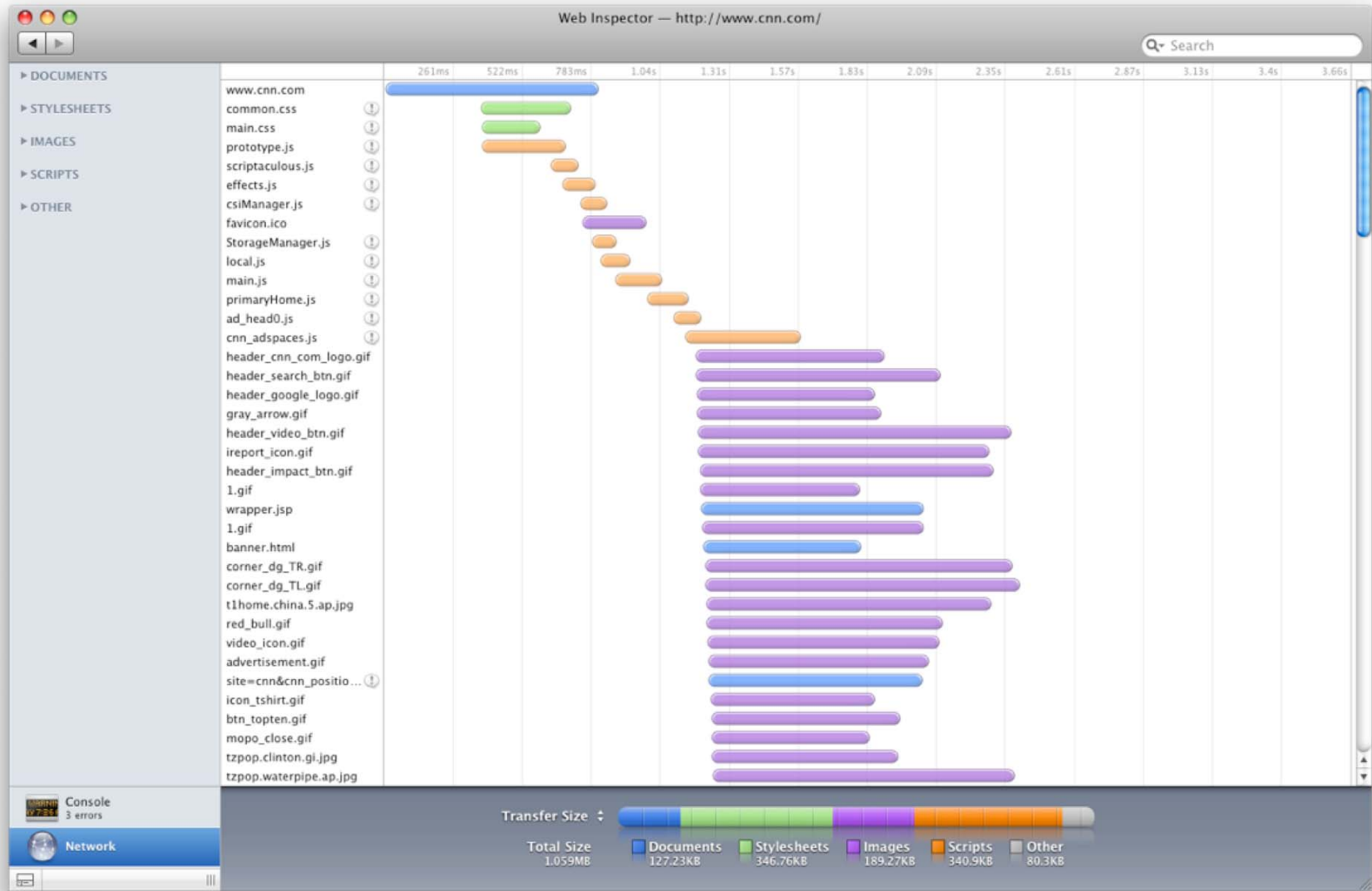
The screenshot shows a browser window with the URL `http://www.cnn.com/`. The page content includes the CNN logo, a search bar, and a navigation menu with categories like HOME, WORLD, U.S., POLITICS, CRIME, ENTERTAINMENT, HEALTH, TECH, TRAVEL, LIVING, BUSINESS, SPORTS, and TIME.COM. A YSlow Firebug plugin is open at the bottom, showing a performance grade of **F (29)**. The plugin lists 13 optimization suggestions:

- F 1. Make fewer HTTP requests ▾
- F 2. Use a CDN ▾
- F 3. Add an Expires header ▾
- F 4. Gzip components ▾
- A 5. Put CSS at the top
- F 6. Put JS at the bottom ▾
- B 7. Avoid CSS expressions ▾
- n/a 8. Make JS and CSS external ▾
- F 9. Reduce DNS lookups ▾
- F 10. Minify JS ▾
- D 11. Avoid redirects ▾
- A 12. Remove duplicate scripts
- C 13. Configure ETags ▾

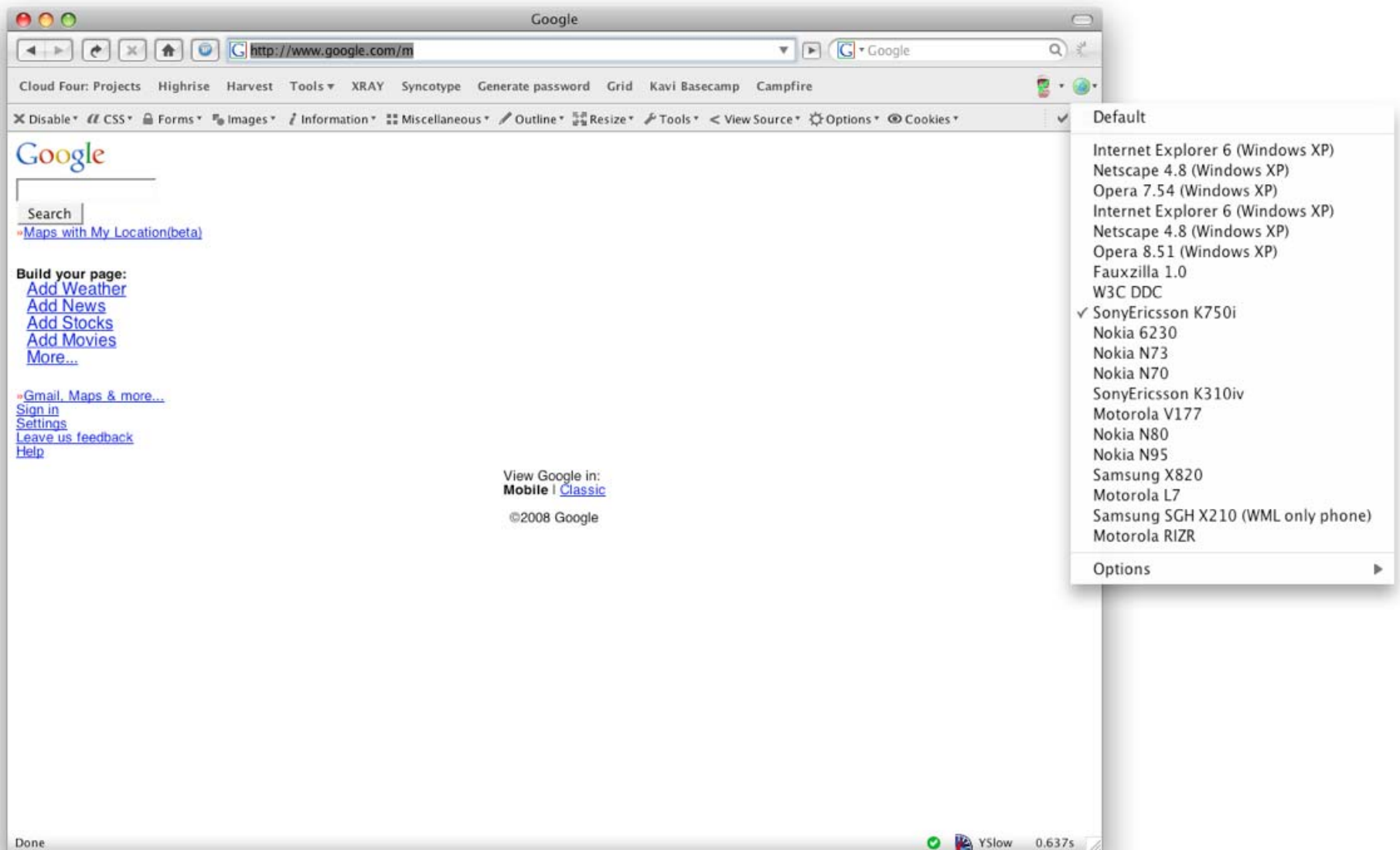
At the bottom right of the browser window, the status bar shows: `F 1033.2K 4.733s`.

YSlow Firebug Plugin
<http://developer.yahoo.com/yslow/>





Safari Web Inspector



User Agent Switcher

<http://chrispederick.com/work/user-agent-switcher/>
<http://dev.mobi/blog/user-agent-switcher-config-file>



Test Your Work!

WARNING

**DIFFICULT
TRAIL AHEAD**

**HIGH, NARROW, STEEP,
SLIPPERY TERRAIN**

**PROCEED WITH
CAUTION**

Flickr photo by MarkKelley: <http://www.flickr.com/photos/markkelley/1022720488/>



Flickr photo by localsurfer: <http://www.flickr.com/photos/localsurfer/180834588/>

**Embrace the
constraints**

**Make
optimization
a game**



Thank You for Your Time!



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