FIVE WAYS TO OPTIMIZE MOBILE WEBSITE PERFORMANCE WITH PAGE SPEED

SNOOZE, YOU LOSE. TODAY'S MOBILE USERS EXPECT PERFORMANCE DELIVERED FAST.

For those of us who depend on the web to drive business results mobile devices represent an important new arena for customer engagement. Google has seen U.S. mobile queries grow by more than **four times** in the last year, and IDC anticipates that in just three years, more Internet users will access the web through mobile devices — such as smartphones — than through traditional PCs.[i]

Enterprising businesses have already heard the call: 90 percent of the top 30 US banks have a mobile initiative in place; 87 percent of the top 30 U.S. retailers have done the same.[ii] And you?
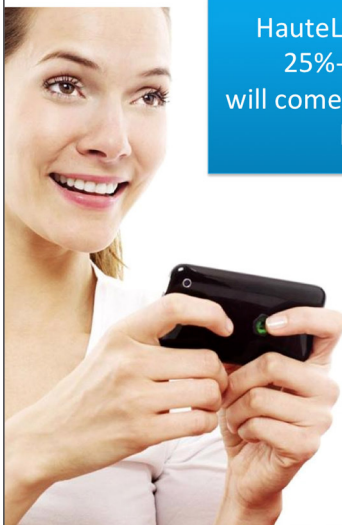

Organizations Are Taking Mobile Seriously

- **90% of the top 30 US banks have a mobile initiative**
- **87% of the top 30 US retailers have a mobile initiative**
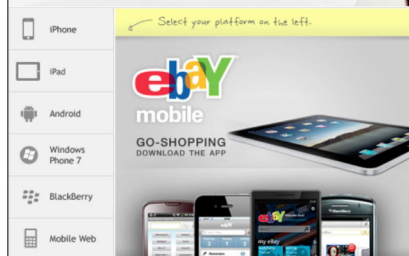
Source: Gomez Research

Mobile Web Usage Is Growing Fast

HauteLook (US Retailer) projects 25%-30% of its online traffic will come from iPhone and iPad users by the end of 2011

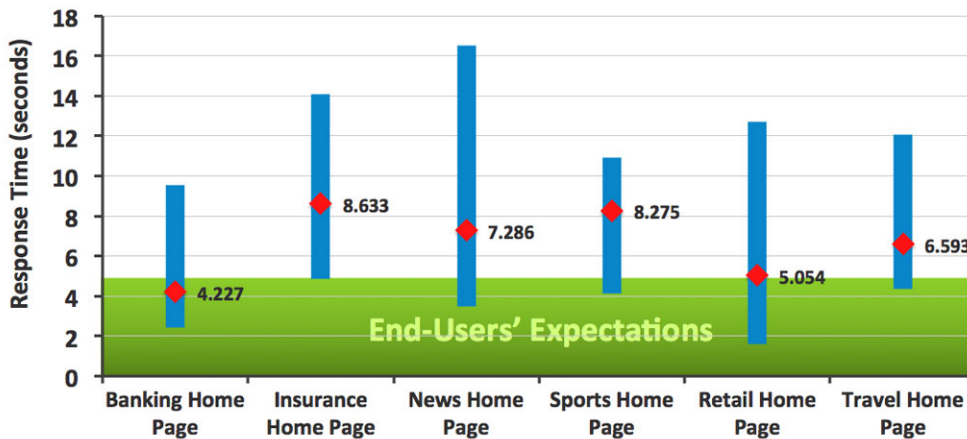In the next 18 months, **15-30%** of traffic to your site will come from **mobile**.

Experts predict that in the next 18 months, **15 – 30 percent of your web traffic will come from mobile devices**.

But great opportunity comes with great danger. In 2009, 58 percent of all mobile users expected websites to load as fast or faster on their mobile phones than on their PCs. In 2011, that number grew dramatically, with 71 percent demanding as good or better performance. Specifically, **89 percent of mobile users expect websites to load in five seconds or less.**

End-Users' Mobile Web Performance Expectations Are Often Not Met

89% of US mobile web users expect a website to load on their mobile phone in 5 seconds or less

Gomez US Mobile Web Home Page Benchmark Response Times Across Verticals (AT&T/iPhone)

Response Time (seconds)

- Banking Home Page: 4.227
- Insurance Home Page: 8.633
- News Home Page: 7.286
- Sports Home Page: 8.275
- Retail Home Page: 5.054
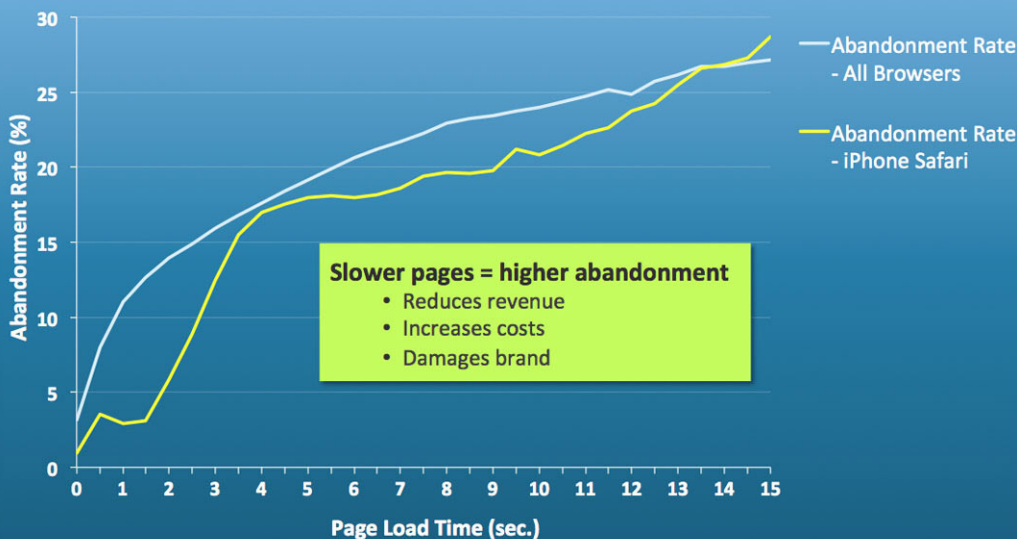- Travel Home Page: 6.593

End-Users' Expectations

Source: 2011 Gomez/Compuware Equation Research Study and Gomez Mobile Benchmarks, May 1 – June 1 2011

Minimum and maximum mobile home page response times — represented by the blue bars — and average mobile home page response times — represented by the red diamonds — largely fail to meet end-users' mobile web performance expectations.

Yet in the Gomez Mobile Home Page Benchmark response times Compuware has found that the majority of top U.S. organizations across multiple verticals **fail to meet** end-user expectations. The result?

Mobile Website Performance Impacts Business Results

Abandonment Rate Across 200+ Web Sites / 177+ Million Page

Abandonment Rate (%)

Page Load Time (sec.)

— Abandonment Rate - All Browsers

— Abandonment Rate - iPhone Safari

Slower pages = higher abandonment
- Reduces revenue
- Increases costs
- Damages brand

Source: Gomez real user monitoring

Escalating abandonment rates that reduce revenue, increase costs and damage the brand. One thing becomes clear very quickly — fast is better than slow. According to Amazon every 100 milliseconds in page load time improvement led to a 1 percent increase in revenue.
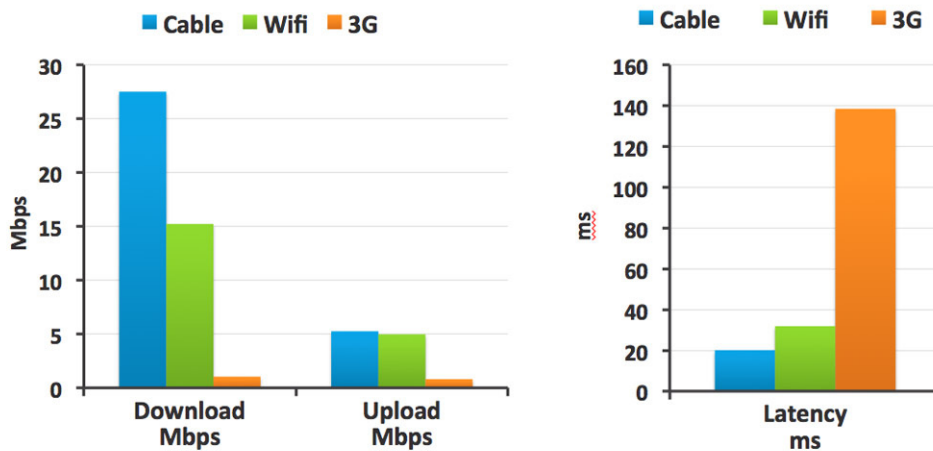
A NEED FOR SPEED

When we looked at how faster ads on mobile devices affected interaction rates, we discovered that click-through rates increased by 12% — a substantial difference!

— Richard Rabbat, Product Manager, Google/DoubleClick

Delivering High Quality, Fast Mobile Websites And Applications Is Difficult

• Different networks offer different experiences

One way to think of mobile networks is as pipes, where latency is the length of a pipe and bandwidth the diameter.

We know that slow, high latency mobile networks can make delivering quality mobile web experiences seem difficult. Yet it is clear that some organizations — across the same networks and devices — deliver exceptional performance while others struggle.

To go mobile means to move fast. The vast majority of web and mobile page load time is spent on the front-end (shorthand for everything after the HTML document arrives).[iii] So you'll find the most favorable opportunities for delivering quick improvements by optimizing front-end performance. Web performance optimization luminaries such as Steve Souders have written at length on how to go about this in "High Performance Web Sites" and "Even Faster Web Sites".

Fortunately, Google's Page Speed tool can save you valuable time and help you improve the front-end performance of your web and mobile sites.

### Front-End Performance Optimization Offers Most Potential

• Front-end improvements often require less time & resources than back-end projects
• Proven, established best practices exist in the form of tools such as Page Speed
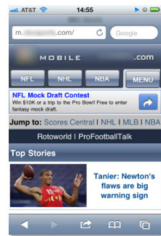
Mobile Page

Web Page

Vast majority of web and mobile page load time spent on the front-end
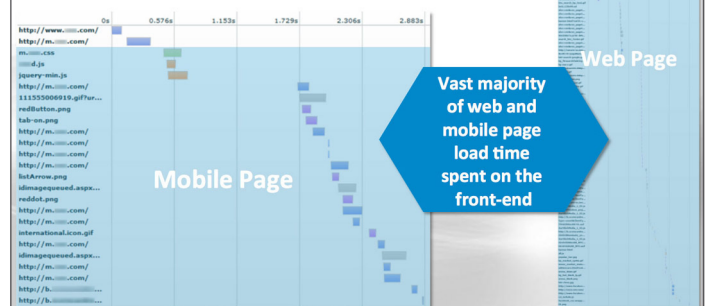
Successful Mobile Websites Are Optimized For Speed

Avg. Response Time = **6.77 sec.**
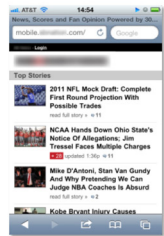
Avg. Response Time = **11.75 sec.**

Google Mobile Page Speed Score = **95/100**

Google Mobile Page Speed Score = **59/100**

Home page tested on iPhone4/AT&T in Boston, Seattle, Chicago every 60 mins. between Apr 1-22 2011

GET UP TO PAGE SPEED

In the following pages, you'll find the **top five ways** you can use insights from Google Page Speed to decrease response times, improve mobile performance and achieve greater revenues from your mobile web initiatives.

By reading this paper you will acquire five best practices for your mobile site — and **one best approach** for making implementation of all five much easier.

Best in class mobile optimized sites like Google.com make extensive use of sprites and data URIs for image delivery.

1: REDUCE ROUND TRIP TIMES

As illustrated earlier, wireless networks are high latency and low bandwidth. That means every time a browser sends a request and waits for a response, your site is compromised by round-trip time (RTT) that drags performance into the sand. Because most of these round trips consist of HTTP requests/responses, it's important to minimize these requests. You should:

- **Avoid unnecessary requests and redirects** by removing redirect chains and time-wasters like broken links and requests that result in 404/410 errors.
- **Combine external JavaScripts and CSS** into as few files as possible.
- **Use sprites to combine images** into fewer files that require fewer bytes and requests.
- **Favor asynchronous fetches** that prevent parallel resource requests from clogging the page load.
- **Favor data URIs** for image delivery to reduce extra requests but keep in mind that Base64-encoded data URIs are 1/3 larger in size than their binary equivalent.

2. MINIMIZE REQUEST OVERHEAD

Take another look at your "luggage": every HTTP request travels with associated cookies that add bulk to the load. In a world of asymmetric Internet connections (for most users: upload-to-download ratios range anywhere from 1:4 to 1:20), the data sent with small object requests can impose big demands on the majority of response time. Jettison the excess baggage by:

- **Minimizing request sizes**: cut cookie and request header sizes to ensure that an HTTP request can fit into a single packet (about 1500 bytes).
- **Serving static content from cookieless domains** so that you reduce the total size of requests made for a page.

3. SHRINK THE PAYLOADS

Just as portion size is a key to effective dieting, controlling the sheer amount of data is crucial to reducing page load times — especially in areas where bandwidth is constrained. When it comes to delivering pages over mobile networks, you should assume that bandwidth will be low and latency high. To minimize payload size:

- **Leverage CSS3** to create effects (such as round corners and shadows) that used to require additional image files.
- **Enable compression** on resources (HTML, CSS, JavaScript) with gzip to cut back your network bytes.
- **Minimize and remove unnecessary JavaScript and CSS** code to save bytes and accelerate downloading.
- **Optimize images** with proper formatting and compression.
- **Defer loading and parsing of JavaScript** for functions that are not called at startup. You'll reduce the initial download size, make room for parallel downloads, and ramp up your render time.


4. REMEMBER, "CACHE" IS KING

In the old model of website delivery, performance was driven by factors within the firewall. Today, however, JavaScript and third-party content and services come into play as major contributors to websites your end-users experience. Web and mobile site performance is driven by the *browser* that integrates page sources inside and outside the firewall. Anything that increases front-end efficiencies will significantly improve the overall mobile web experience.

The best starting point are the web page's resources such as CSS, image and JavaScript files — that must be downloaded over the network before the page can load. Caching this content locally not only reduces network requests but also trims back the total payload of subsequent pages.

To optimize content caching after the first download:

- **Apply browser caching** by setting an expiry date or a maximum age in the HTTP headers that instruct the browser to load previously downloaded resources from the local disk, rather than over the network.
- **Leverage proxy caching** that enables public caching in the HTTP headers, allowing the browser to draw resources from a nearby server instead of the more remote origin server.
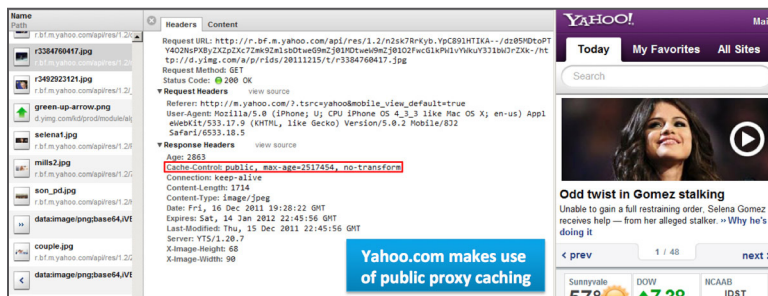
Best in class mobile optimized sites like Bing.com make use of the latest caching mechanisms.

- **Use an HTML5 application cache** so that your page can be displayed immediately while updates are fulfilled in the background.
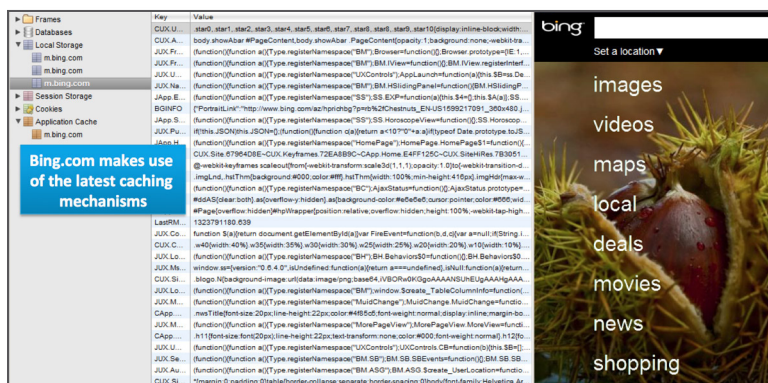
Best-in-class mobile optimized sites like Yahoo.com make use of public proxy caching.

5. OPTIMIZE BROWSER RENDERING

The previous four tips focused on resource downloads. Once the resources have arrived, however, the end-user's browser needs to load, interpret and render HTML, CSS and JavaScript code. Keep in mind that you shouldn't style content with Javascript frameworks if you can create the same effect on the serverside. You can boost performance on the client side by formatting your code and pages in ways that exploit the characteristics of current browsers. Help these browsers help themselves:

- **Favor touch events** over click events to initiate actions. Every click event imposes a 300-500ms delay while ontouch events eliminate delays altogether.
- **Use efficient CSS selectors**, instead of inefficient key selectors that match large numbers of elements, to accelerate page rendering.
- **Put CSS in document heads**: Improve rendering performance by moving inline style blocks and <link> elements from the document body to the document head.
- **Specify image dimensions and character sets**: the former eliminates unnecessary reflows and repaints while the latter allows browsers to parse HTML and execute scripts immediately.

EXTRA TIP
KEEP SERVER-SIDE RESPONSE AS FAST AS YOU CAN

One thing to keep in mind is when we deliver content over high latency/low bandwidth mobile networks we have to optimize server-side delivery to get more legroom for dealing with slower networks. Looking at the application delivery chain, which starts at the end user and goes all the way back to the server-side, it becomes clear that any time we lose on the server cannot be compensated by upstream optimization.

URL		Cac...	Ki...	Stat...	MIME	Server [s]	Size [byte...	Time Chart
http://mobile.	.com/xhtml/large/konybasicxhtml.css	no	Net	200...	text/css	5.69	70505	
http://mobile.	.com/xhtml/large/images/ifnot.png	no	Net	200...	image/png	5.61	861	
http://mobile.	.com/xhtml/large/images/imore.png	no	Net	200...	image/png	5.60	732	
http://mobile.	.com/xhtml/large/images/imps.png	no	Net	200...	image/png	5.60	649	
http://mobile.	.com/xhtml/large/images/istar.png	no	Net	200...	image/png	5.60	1758	
http://mobile.	.com/xhtml/large/images/bigbac.png	no	Net	200...	image/png	5.55	232	
http://mobile.	.com/xhtml/large/images/ifavail.png	no	Net	200...	image/png	5.50	1170	
http://mobile.	.com/	no	Net	200...	text/html	0.46	12417	

If the backend servers and infrastructure are slow — no matter how optimized the site is from a front-end perspective — the site will feel slow the end-user.

USE THE FASTEST WAY TO APPLY FRONT-END PERFORMANCE OPTIMIZATION TO YOUR MOBILE SITES

Optimize mobile performance to the standard that matters most: the end-user experience that will make or break the mobile side of your business. To deliver quality mobile web experiences to your end-users focus on the following major optimization areas:

- Reduce round trip times
- Minimize request overhead
- Shrink the payloads
- Remember, "cache" is king
- Optimize browser rendering
- Keep server-side response as fast as you can

Google Page Speed Integration With Compuware Application Performance Management Platform

Optimize web and mobile site speed with actionable insights & proven best practices

Fortunately, there's an easy way to integrate the performance optimization techniques outlined in Google Page Speed into your Internet operations: The Compuware Application Performance Management (APM) Platform. With the Compuware APM Mobile Solution, you get instant, real-time access to Page Speed insights, proven best practices and actionable performance indicators that tell you what your end-users are *really* experiencing — and how you can improve that experience in ways that lift your bottom line.

PUT YOUR MOBILE SITE TO THE TEST

How does your mobile site measure up? The Gomez Mobile Readiness Tests leverages proven, established mobile web application optimization best practices from Page Speed and others to provide organizations actionable recommendations on how to improve mobile web application performance. Put it to the test, for free, at http://www.gomez.com/mobile-readiness-test/

ABOUT GOMEZ

The Gomez platform is the industry's leading solution for optimizing the performance, availability, and quality of web, non-web, mobile, streaming and cloud applications. The Gomez approach to application performance management starts by measuring end-user experience and all the components that contribute to it to proactively detect performance issues, quantify their business impact and accelerate resolution. The Gomez solution works for any type of application, including enterprise applications accessed by employees, e-commerce web sites visited by customers or applications running on mobile devices. Only the Gomez "First Mile to Last Mile" solution eliminates blind spots across the entire application delivery chain, from the browser on a user's computer or mobile device, across the Internet or a corporate WAN, across third-party and cloud providers, to the complex infrastructure inside data centers. Business managers, IT operations personnel and application development/QA engineers benefit from the insight provided by the Gomez solution. More than 4,000 customers worldwide, ranging from small companies to large enterprises and managed service providers, use Gomez to increase revenue, build brand loyalty and decrease costs.

To learn more about Gomez, visit:
compuware.com/apm

i http://googlemobileads.blogspot.com/; http://www.idc.com/getdoc.jsp?containerId=prUS23028711

ii Compuware Research

iii http://www.google.com/url?sa=t&rct=j&q=souders%20front-end%20everything%20after%20the%20html%20arrives&source=web&cd=1&ved=0CB0QFjAA&url=http%3A%2F%2Fcs193h.stevesouders.com%2Fslides%2Fcs193h-02-importance-of-frontend-performance.ppt&ei=hIX8TtHTC4Gf-wbn_sHDAQ&usg=AFQjCNHFp7ptpf1iekxmk_jobp57tKt3tg&cad=rja

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