How Mobile Performance Affects Your Bottom Line

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AT&T Developer Program
Performance Makes A Difference

How many of you develop, manage, or work on a company mobile app or web site?

Odds are you’re losing money. Right now. Every minute. And it’s all needless.

This is true for over 96% of apps we’ve tested.
Performance Makes A Difference

1. Mobile = Real Money

2. Ignoring Mobile Performance = Less $$$

3. Improving Mobile Performance = More $$$

4. You Can Improve Mobile Performance
Mobile = Real Money
Mobile = Real Money

Mobile Tech Makes Money Many Ways:

- Mobile commerce
- Advertising revenue
- Paid apps
- Customer intelligence
- Marketing and PR
- Paid add-on features
Mobile = Real Money

U.S. Retail Mobile Commerce Is Growing: (1)

• Over $41 billion in 2013

• 68% increase from 2012

• Projected to exceed $110 billion by 2017

(1) eMarketer Report, September 5, 2013; “Mobile Devices to Boost US Holiday Ecommerce Sales Growth”
Mobile = Real Money

Mobile ad spending for North America is rising: (1)

- Will reach $7.7 billion in 2013
- Expected to grow to $27.1 billion in 2017
- Is taking share from print, TV and the wired web
- Mobile ad rates are rising

Mobile = Real Money

• Thanksgiving Day & Black Friday 2013, mobile took **24.2% of all online sales**, a new record; 15.6% from tablets, 8.6% from smartphones.

• Thanksgiving Day ‘13 = **$257 million** in mobile sales

• Black Friday ‘13 = **$467 million** in mobile sales

• Cyber Monday ‘13 = **$419 million** in mobile sales

(1) Tech Adobe® Digital Index 2013 online shopping data: “Adobe Reports Mobile Sales Records on Thanksgiving Day, Black Friday”

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Mobile = Real Money

Mobile is driving all of Facebook’s Revenue Growth (1)

(1) Facebook financial reports
Mobile = Real Money

Tablets now even with smartphones in retail spending

U.S. mobile retail spending by device (1)

(1) Business Insider Report, November 2013; “Smartphones For Online Shopping, But Retailers Aren’t Ready”
http://www.businessinsider.com/tablet-shoppers-in-mobile-commerce-2013-11#ixzz2mCZo7ozP

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Ignoring Mobile Performance = Less $$$
What Does Performance Mean?

It Means an App is…

• Fast
• Dependable
• Efficient
• Responsive

That’s what users demand!
Does Performance Matter?

Small Increases In Loading Have A Big Effect:

• **100ms delay** & Amazon sales decrease by 1% \(^{(1)}\)
• **500ms delay** & Google ad revenue reduced 20% \(^{(1)}\)
• **400ms delay** & Yahoo! saw 5-9% drop in traffic \(^{(2)}\)
• 59% expect mobile apps to **load in 2 seconds or less** \(^{(3)}\)

\(^{(2)}\) Stoyan Stefanov, “Don’t make me wait! or Building High-Performance Web Applications”
http://www.slideshare.net/stoyan/dont-make-me-wait-or-building-highperformance-web-applications
Does Performance Matter?

Users Rate Performance As Very Important (1)

- Very or Somewhat Important = 84%
- Not That or Not At All Important = 5%

Poor Performance = Lost Revenue

Shoppers won’t tolerate poor performance:  (1)

- 66% failed to complete a transaction due to obstacles encountered during checkout
- 41% say checkout was too difficult on their device
- 23% say a purchase would not go through

(1) Results from the 2013 Mobile Consumer Insights survey released by Jumio, Inc. and conducted by Harris Interactive
Poor Performance = Lost Revenue

Neither will content consumers…

• Already perceive loading to be 15% slower than it is

• If they can’t consume content:
  – They may delete your app
  – Won’t visit your other sites
  – Won’t become long-term users
Poor Performance = Lost Revenue

Advertisers certainly won’t tolerate it …

• Won’t get click-through from their advertising
• Won’t advertise with you
• Or will expect to pay less
• Will pass along their criticism
Poor Performance = Higher Ad Cost

Pay-Per-Clicks cost is tied to performance

- Page-abandonment is a problem with Pay-Per-Click
- Visitors quit before page loads if it's slow or unavailable
- You pay for visitors who never see your pages
- Which wastes money and hurts brand awareness
Frustrated Users Can React Badly

Consumer Reaction to a Poor Mobile Experience (1)

- Less likely to go to that company's site: 21%
- Have a negative overall perception of the company: 24%
- Give the mobile app a low rating: 26%
- Less Likely to purchase from that company: 31%
- Tell others about poor experience: 31%
- Switch to a competitor's mobile app: 34%
- Less likely to use the mobile app: 48%


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Improving Mobile Performance
= More $$$
Better Performance = More Revenue

How does better performance make money?

• Satisfied shoppers buy more goods and buy more often
• Happy users visit more - become loyal users
• Loyal users recommend the app
• Advertisers get more action from advertising with you
• Your outside advertising gets more click-throughs
Better Performance = More Money

Better Performance…

• Makes users happy - and happier users stick around
• Speeds sales transactions
• Increases advertising revenue
• Lowers advertising cost
• Saves on overhead
• Improves your reputation
• Offers new PR opportunities
Speed Is A Big Part of Performance

• Studies have found that with 1 second of latency\(^1\)
  – Customer satisfaction drops 16%
  – Conversion to sales drops 7%

• 10 Golden Principles of Successful Web Apps: \(^2\)
  “Speed is always the most important feature”

• Users expect mobile to be as fast as desktop \(^3\)

\(^1\) http://econsultancy.com/us/blog/10195-the-need-for-online-speed-in-america
\(^3\) http://econsultancy.com/us/blog/9162-the-importance-of-speed-for-mobile-commerce
Faster Speed = Lower Costs

Better Performance Lowers Cost Per Click

• Google **counts load speed** as a factor in its Quality Score,

• **Fast response time** contributes to higher Quality Scores, which contribute to lower costs per click

Lower marketing costs

• By improving speed by 5 seconds Shopzilla doubled Search Engine Marketing (SEM) visits on its web site (1)

(1) "Shopzilla Site Redesign: We Get What We Measure" (2009)
Advertising Opportunities Are Rising

U.S. Consumer Media Consumption Share (1)

Mobile is the only media where **use-time is rising**!
But you need solid performance to take advantage of it.

(1) eMarketer Report, September 25, 2013; “Worldwide Ad Growth Buoyed by Digital, Mobile Adoption”

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More Benefits of Better Performance

Development Focus Improved
• Problems rooted out faster – less quality fixes
• Development cycles can focus on new features

Decreased Capital Outlay
• Better performance = fewer servers
• Better performance = lower network costs

Improved Brand Reputation
• Positive PR
• Positive reviews
• Positive blog and twitter conversations
• Positive word of mouth
You Can Improve Mobile Performance
How Can You Improve Performance?

Short Answer:

1. Follow Best Practices!
2. Keep Testing!
Follow Mobile Best Practices!

Learning and implementing Mobile Best Practices will make your app load faster, respond quicker, and improve your bottom line.

Below are Mobile Best Practices seen on our site and tested in ARO:

<table>
<thead>
<tr>
<th>Mobile Best Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Accessing Peripherals</td>
</tr>
<tr>
<td>• HTTP 400 and 500 Error Codes</td>
</tr>
<tr>
<td>• Asynchronous Load of JavaScript in HTML</td>
</tr>
<tr>
<td>• Managing Images with CSS Sprites</td>
</tr>
<tr>
<td>• Cache Control</td>
</tr>
<tr>
<td>• Minify CSS, JavaScript, and HTML</td>
</tr>
<tr>
<td>• Cache Expiration</td>
</tr>
<tr>
<td>• Multiple Simultaneous TCP Connections</td>
</tr>
<tr>
<td>• Closing Connections</td>
</tr>
<tr>
<td>• Periodic Transfers</td>
</tr>
<tr>
<td>• Combine JavaScript and CSS Requests</td>
</tr>
<tr>
<td>• Offloading to Wi-Fi</td>
</tr>
<tr>
<td>• Content Pre-fetching</td>
</tr>
<tr>
<td>• Opening Connections</td>
</tr>
<tr>
<td>• Duplicate Content</td>
</tr>
<tr>
<td>• Resize Images for Mobile</td>
</tr>
<tr>
<td>• File Order of External Style Sheets and Scripts</td>
</tr>
<tr>
<td>• Screen Rotations</td>
</tr>
<tr>
<td>• HTTP 1.0 Usage</td>
</tr>
<tr>
<td>• Text File Compression</td>
</tr>
<tr>
<td>• HTTP 300 Status Codes</td>
</tr>
</tbody>
</table>
Follow Mobile Best Practices!

Top Five Issues Impacting Performance:

1. Lack of caching
2. Not closing connections
3. Poor management of periodic connections
4. Connections that need better grouping
5. Error messages and redirects
Issue #1 – Lack Of Caching

Learn to cache your content

• **17%** of all mobile traffic is duplicate downloads of the same unaltered HTTP content (1)

• That is a needless drag on users, servers, and networks

• Reading from local cache is **75-99% faster** than downloading from the internet

### Issue #1 – Lack of Caching
Caching Is Supported by Libraries

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Android Connection Libraries</th>
<th>iOS Libraries</th>
<th>Android &amp; Safari</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UC</td>
<td>HUC</td>
<td>HC</td>
</tr>
<tr>
<td>Basic caching</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Revalidation</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Non-caching directives</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Expiration directives</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>URL with query string</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Partial caching</td>
<td>○</td>
<td>○</td>
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</tr>
<tr>
<td>Redirection</td>
<td>○</td>
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</tr>
</tbody>
</table>

But even though caching IS supported – it is OFF by default! Native app developers need to set it up in order for it to work.
Learn How to Cache Correctly

**ETags**
- Using Etags **is not recommended**
- Each file has a Unique Tag
- Revalidated on server for each request
  - Breaks the rule of making fewer HTTP Requests
  - Adding a connection drains battery, adds 500-3,000 ms latency

**Cache Control**
- **Cache Control is recommended**
- Important to carefully assign Max-Age times
- App will not check file on server until Max-Age is reached
  - Retrieval is strictly file processing time

---

HTTP/1.1 304 Not Modified
Date: Mon, 29 Oct 2012 20:53:03 GMT
Server: Apache
Connection: close
ETag: "2d4f-4cd372961990"
Expires: Tue, 29 Oct 2013 20:53:03 GMT
Cache-Control: max-age=0

---

HTTP/1.1 200 OK
Date: Mon, 29 Oct 2012 20:51:38 GMT
Server: Apache
Last-Modified: Mon, 28 Jun 2004 00:03:33 GMT
Accept-Ranges: bytes
Content-Length: 27007
Cache-Control: max-age=1437313
Connection: close
Content-Type: image/jpeg
public void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.main);

    try {
        File httpCacheDir = new File(getCacheDir(), "http");
        long httpCacheSize = 10 * 1024 * 1024; // 10 MiB
        HttpResponseCache.install(httpCacheDir, httpCacheSize);
    } catch (IOException e) {
        Log.i(TAG, "HTTP response cache installation failed:" + e);
    }
}

Android 4.0 Makes Caching Easy

Add this!

Consider adding reflection for older versions of Android

Issue #2 – Not Closing Connections

Also known as Late Termination

Greater than 80% of applications do NOT close connections when they are finished sending data.

Termination must be completed through a separate connection, which wastes airtime and energy.

And the issue is more pronounced with LTE.

38% more power is used on LTE! (18% more power on 3G)
Issue #2 – Not Closing Connections

The sample code below from the Android SDK shows how to close a connection after downloading content.

```java
HttpURLConnection getimagecloseconn = (HttpURLConnection) urln.openConnection();
getimagecloseconn.setRequestProperty("connection", "close");
getimagecloseconn.connect();
String cachecontrol = getimagecloseconn.getHeaderField("Cache-Control");
InputStream isclose = getimagecloseconn.getInputStream();
bitmap = BitmapFactory.decodeStream(isclose);
getimagecloseconn.disconnect();
```

https://github.com/attdevsupport/ARO/tree/master/2013DevSummitTurbocharge
Issue #3 – Periodic Connections

Manage periodic connections (ads, analytics) efficiently

Regular 3 minute polls for updates (20% of total battery/day)

Download ad every 30 seconds

More efficient and will save airtime
Issue #4 – Grouping Connections

Managing connections properly will speed up your application and save user’s batteries. Examples:

- Group connections together whenever possible
- Thread your downloads vs. serial downloading
- Remove redirects to files
- Pre-fetch files that are used often
Imagine an app that:
1. Downloads an image every 60s
2. Downloads an Ad every 60s
3. Sends Analytics to a Server every 60s

38J of energy used

Same app with connections grouped

16J of energy used - 58% savings!
Issue #5 – Errors And Redirects

• Check your app for HTTP error and redirect response codes

• AT&T’s ARO diagnostic tool checks for these codes, identifies the cause and offers solutions
Keep Testing!

Test & Analyze With ARO. It’s A Game Changer.

• ARO shows how your app is handling data, uncovers hidden issues, and **recommends specific best practices to fix them!**

• ARO stands for **AT&T Application Resource Optimizer**

• It is a **FREE diagnostic tool** made specifically for mobile apps

• **Award winner**: 2013 GSMA Smartphone Challenge Award

• **ARO used by CTIA** for app ranking on KnowMyApp.org

• Get more information at [Developer.att.com/ARO](http://Developer.att.com/ARO)
Keep Testing!

There are many things to test:

- Functionality & usability
- Network performance
- Memory leakage
- Interrupt testing
- App installation
- OS compatibility
Keep Testing!

- Over 96% of apps we tested required optimization
- Think like a user – Test like a user
- Test under a range of conditions
- Test every release on all relevant platforms/devices
- Test on different networks (i.e., 4G, 3G, 2G, Wi-Fi, etc.)
- Use ARO!
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Thank You