

# INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATION & MANAGEMENT

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**A STUDY OF INCREASING THE PERFORMANCE OF ANDROID****T RAMATHULASI****ASST. PROFESSOR****DEPARTMENT OF MCA****SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY  
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CHITTOOR****ABSTRACT**

Nowadays, a smart phone is an indispensable tool for everyday living and smart phone enthusiasts are eager to upgrade the performance of their devices. In this paper we present an approach to improve the performance of a smart phone. It is user friendly. Detailed procedures of these optimization steps are provided which ordinary users can apply. It is user friendly. Using these same techniques, we performed optimizing experiments on an Android phone and included the results. Memory cleaning also showed significant savings in terms of memory space in the device. Here we discuss about the performance matters and challenges.

**KEYWORDS**

Performance Upgrade, Bugs and Battery Life.

**INTRODUCTION**

Performance is quite the buzzword these days. In just the field of mobile applications, it can mean a number of different things: from how an application is implemented, how it works, how efficient it is at how it works, and if all of these aspects were indeed enjoyable. From an Android perspective, we'll be looking at how well our app behaves across thousands of different devices, all with varying OS SDK levels, screens, processors, etc. While just getting our app to run (and hopefully render correctly) across such a distribution of devices is daunting on its own, we want to take our application a step further, and make it run well on the 19,000 different Android devices, giving EVERY user the ultimate experience for our Android app. We will be looking at performance specifically in terms of applications power management, efficiency, and speed. We'll explore tools that will help us identify and pinpoint the performance issues typically found in Android applications, and once we find the issues, discuss potential remedies. Some fixes will be quick and easy wins. Other ideas may require more work, code refactoring, and potentially major architectural changes to our mobile application. This may not always be feasible, but knowing where our apps weaknesses are can help us as we iterate and improve our mobile app over time.

We will learn the techniques to benchmark our application, and the tricks to improve the efficiency, performance and the speed of our application. This will improve our application's performance, the inner workings will be faster, which will lead to a more streamlined and enjoyable application performance for the end user.

**PERFORMANCE MATTERS**

Mobile application performance is extremely important. We all absently pull out their phone and fire up an application. Because Android users use applications as a distraction, they are easily distracted, and often multitasking. If our app does not hold their interest through the many distractions of the day, our app usage and engagement will plummet. Human engagement studies show that actions that take under 100ms are perceived as instant, where actions that take a second or more allow the human mind to become distracted. Delays and slowness in our app (even if just perceived slowness) are a detriment to our mobile app, and potentially to our customer's phones too (a study in 2012 found that slow apps caused 4% of users to throw their phone!).

Imagine an e-commerce application. This application has collected analytics showing that the average e-commerce session is 5 minutes long, and each screen load takes an average of 10 seconds to complete. Our screen view budget/session is 30 views to complete a sale. If we are able to lower the load time of each view by 1 second, we have added 3 more screen views to the average session. This could allow our customers to add more items to their cart, or perhaps just complete the entire transaction 30 seconds faster!

This completely made up scenario is actually backed by real world data. A one second delay in webpage load time leads to 7% drop in sales 11% fewer page views 16% drop in customer satisfaction.

Amazon.com has discovered similar statistics. When they added just 100ms of delay to webpage's, their revenue dropped by 1%. Shopzilla re-architected their website for performance, and saw page views increase by 25%, increased conversions by 7-12%, and actually used half the nodes they previously required!

Beyond sales and revenue, mobile applications with poor performance get lower rankings in Google Play. Even worse, bad apps have been pulled from the market. In 2011, T-Mobile asked Google remove the YouMail application from the Android Market. YouMail is a 3rd party voicemail app, and this application polled its server every second to ask "Is there new voicemail?" An install base of ~8,000 customers on T-Mobile generated more hits on the network than Facebook! Arguably, this all occurred prior to widespread usage of Google Cloud push messaging. But applications with similar behavior are still in Google Play today, and as we will see, they have detrimental performance effects on servers, networks and Android devices.

Sometimes our architecture is good enough for launch, but what happens when we get bigger? What if our app gets an ad placed during the next Super Bowl? Is our app/server architecture ready for fast exponential growth?

## ANDROID PERFORMANCE CHALLENGES

Building an Android application is a complicated process. From phones with screens that go from teeny 240x360 to 1440x2560 pixels ratios and dozens of variations in between (and that is just the phones!). Not only does your application need to look great on phones, phablets and tablets, but it has to run on devices running a dozen different variants of the Android operating system. As of September 2014, 88% of Android users are using devices running OS versions Ice Cream Sandwich (or higher). Supporting just these users still requires us to support 7 levels of the Android SDK. Contrast this Android complexity with iOS development, where we have 6 devices with screen sizes, and in October 2014, 2 versions of the OS (7 and 8) made up 92% of all users.

These devices, despite their multitudes of differences, all contain amazing computing horsepower, location awareness and the internet. With all of these challenges, it is no wonder that application performance can be difficult. I hope that this book will help us slay some of the beasts and gremlins that are causing delays, jitter and other performance issues common to mobile applications.

We are building an Android application (or we already have.) Despite this, we are not totally happy with our apps performance? (why else did we pick up this book?) Uncovering mobile performance issues is a job that is never complete. There will always be opportunities to squeeze more performance out of our application, and new inefficiencies will arise as a part of new feature development. The goal of this book is to help understand the pitfalls of mobile performance, expose some of the tools to test for issues so that we can catch any major performance issues in our mobile application before it impacts our customers.

## LAUNCHING WITH BUGS

With such a complicated development platform, it is inevitable that some bugs will slip through our testing processes and affect customers. However, a recent study showed that 44% of Android app issues and bugs were discovered by users, and 24% of those were actually passed on to the developers by users leaving feedback in Google Play reviews. Negative reviews are not the way we want to discover issues. Not only is one customer frustrated, but all of our future potential customers will have the ability to see our dirty laundry when they look at the reviews. When customers see reviews discussing bugs and problems with our app, they may decide to not continue the download. If we are using advertising for customers, we know the costs of customer acquisition. As the number of apps have increased and the Play store has become more crowded, customer acquisition has gotten more expensive, so anything that discourages download of our app is costing you money!

There is a huge push in the software industry to launch as quickly as possible, and clean up the bugs and residual issues in a subsequent release. QA time is always at a premium, and is nearly always the first item on the chopping block for a tight schedule. While in sports, the MVP is the star of the game, in development, the Minimally Viable Product is a development curse we have all faced. Launch with just enough launch first and build (or fix) the rest later. Development of Android apps is no different, but there is an impact to our customers, and it is crucial that we understand the side effects of launching with major performance issues.

## CONSUMER REACTION TO PERFORMANCE BUGS

Mobile applications usage is incredibly different from the web or other forms of software. App user retention is a hard nut to crack - in 2014, 16% of downloaded Android apps is launched only once. Customers are easily distracted, and with so many choices in the app markets, they will quickly try another app that is similar, or does the same thing.

Now there could be many reasons that users abandon apps. It can be argued that being frustrated with an application is a top reason to abandon or uninstall. According to a study by Perfect Mobile the top user frustrations are:

1. User Interface Issues (58%)
2. Performance (52%)
3. Functionality (50%)
4. Device Compatibility (45%)

While performance is directly called out as the #2 reason for customer frustration, it is clear that the other top 4 responses also have aspects of performance to them. It becomes pretty clear that the major reasons customers stop using apps are due to issues related to performance.

Adopting a MVP approach to your Android app, where the initial launch contains bugs and performance sinks assumes that when the fixes are made, you:

1. Still have an audience
2. They update your application and
3. They launch the updated app to see the improvements

Twitter has reported that it takes 3 days for 50% of their users to upgrade their Android app, and 14 days for 75% of the user base to update to the latest version. They find this to be extremely repeatable. So if we are not uninstalled, you still have to hope that your updates are:

1. Actually updated.
2. Opened up so that the fixes are seen.

## SMARTPHONE BATTERY LIFE - THE CANARY IN THE COAL MINE

The studies above show that consumers prefer fast apps, and apps that do things quickly. Additionally, one of the top concerns of smart phone owners is battery life. While it is not (yet) common knowledge to customers, applications (and especially non-optimized applications) can be a MAJOR factor in battery drain. I use my end of day battery percentage as an indicator of how apps are performing on my phone. If I notice a sudden dip in battery life, I begin to investigate recently downloaded apps for potential issues. We'll show how battery drain of the mobile device can be used as a proxy for application performance, and how improving the performance of our app will extend our customers battery life.

That said, the top drainers of mobile battery are the screen, the cellular and Wi-Fi radios, and other transmitters (think Bluetooth or GPS). We all know that the screen has to be on to use different apps, but the way our mobile app utilizes the other power draining features of a mobile device can have huge effects on battery life.

Consumers typically blame the device, device manufacturer or the carrier for device battery issues. The tools available to consumers displaying how applications drain the battery only just now coming to market, but the quality is radially improving. It is only a matter of time before consumer consciousness of battery life as related to apps really takes off. Thankfully, the tools for developers to minimize power drain are also beginning to surface, and we'll explore these tools. It is best to be as battery and power conscious as we can while architecting and building our mobile applications.

## CUSTOMERS WANT HIGHLY RESPONSIVE APPS

If we have not come to this conclusion before picking up this book, I hope that the above examples have shown you how important application performance really is. If customers are reporting bugs in our app rankings (which discourages future customers), and people walk away from and uninstall poorly performing apps, it is obviously imperative that our application runs with as few performance issues at initial launch. MVP launches, and slow apps with poor performance are rarely given a second chance - it is uninstalled, and never downloaded again - even if V1.1 has all the right fixes in it. By then, we are too late for those initial customers.

## TESTING OUR APP FOR PERFORMANCE ISSUES

The best way (pre-launch) to discover performance issues is to test, test and test some more. I'll cover the devices you should use for testing in order to cover as much of the Android ecosystem as possible. In subsequent chapters, I'll walk through many of the tools available to help us diagnose performance issues, and



tips to resolve them. Once we are in market, ensure that our app reports back to us on usage patterns and issues that our customers are facing. Read these reports, and dissect the information so that we can resolve issues discovered in the field.

**SYNTHETIC TESTING**

Synthetic tests are created in the lab, to test specific use cases, or perhaps to mimic user behaviors in your mobile application. Many of the tools we’ll discuss in future chapters run with synthetic tests - where we as a developer, run our app through its paces, and look for anomalies. This is a great way to work many bugs and performance issues. However, with 19,000 Android User agents reported by Akamai, there is no way we can possibly run synthetic test for every possible scenario.

**RUM TESTING**

I know, that sounds really promising, doesn’t it? “Hey boss, the team needs to go out and test out our RUM.” RUM really stands for Real User Measurements. Because it is unlikely that you will be able to find all of our apps performance issues prior to launch in our synthetic tests, and it is not realistic to assume our customers will report all of the issues they see, we need another option. By inserting analytics libraries into our application, we can collect real time data from all of our users - allowing us to quickly understand them types of issues they might be facing. This gives us the chance to respond to customer issues/bugs that are discovered in the field. Of course, once resolved, it is smart to find ways to replicate such issues in the lab - to avoid future releases with issues.

**5 WAYS TO INCREASE THE ANDROID PHONE’S PERFORMANCE**

If our Android’s performance is starting to sag, don’t worry. There are several steps we can take to restore our device to working order. Use these five tips to stay vigilant against performance lag by updating problem apps and managing system resources. Want step-by-step instructions to speed up our device? Keep reading for 5 Ways to Boost our Android Phone’s Performance, the second installment of our six-part Android Phone Makeover series.

FIG. 1: INCREASE PERFORMANCE



**1. KILL BACK GROUND APPS**

Android’s capability to multitask across several applications is great, but you don’t need the YouTube app wasting battery life and memory resources when running in the background. It’s best to completely close apps with the Advanced Task Killer app (free). Unlike Android’s built-in app shutdown, this download shows a single list of each running app on our device and lets you select the ones you’d like to turn off.

FIG. 2: KILL SELECTED TASKS



**2. KEEP APPS UP TO DATE**

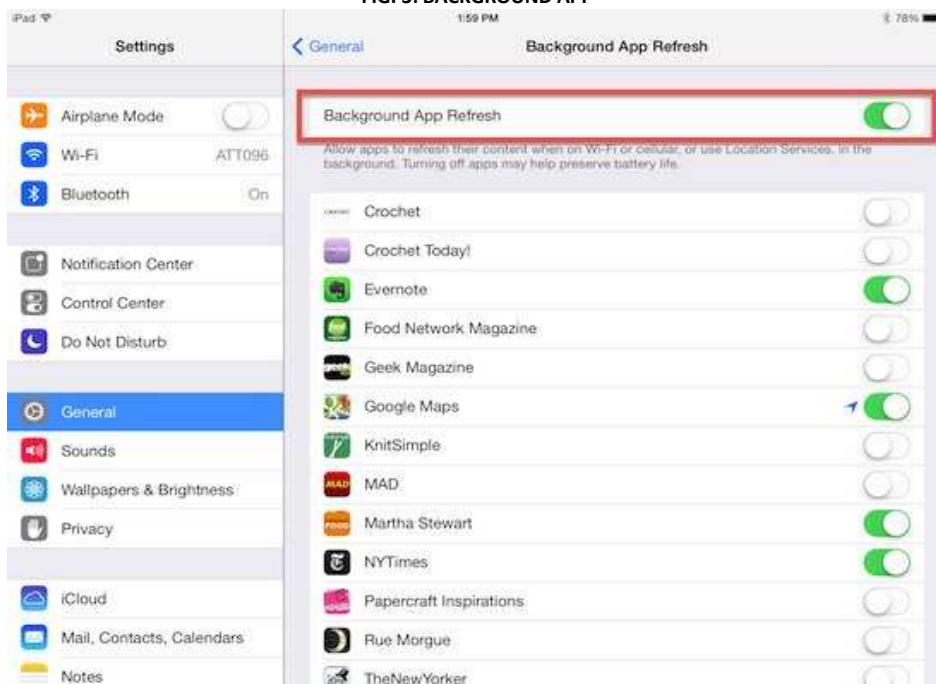
It's not always the operating system that causes you grief. If you feel an app is slowing you—or your phone—down, check the Android Market for an update.

1. Launch the Android market. Tap the menu button.
2. Select my apps.
3. Check each app for updates on the right.

**3. TURN OFF BACKGROUND DATA**

Apps aren't the only thing to run in the background. Such services as Face book, Twitter or Weather Bug constantly downloads data so that when you launch them, all the content is up to date. That's easy to stop.

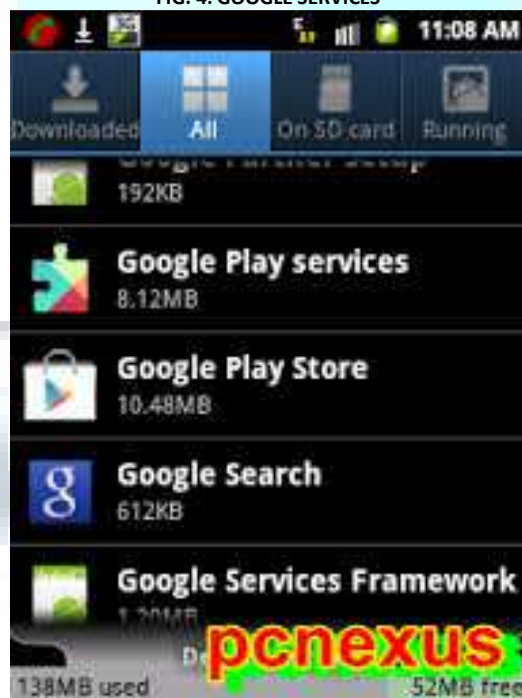
**FIG. 3: BACKGROUND APP**



**4. MANAGE GOOGLE SERVICES**

An Android device automatically includes access to Google services including Books, Contacts, Currents, Gmail and Google+. If we don't need these services, turn them off and save our wireless radio the trouble of downloading more data (pictured below).

**FIG. 4: GOOGLE SERVICES**



**5. DEFRAG OUR SMARTPHONE'S MEMORY**

Just like a PC, our Android phone's internal RAM gets a performance boost after undergoing defragmentation. A free app called Memory Booster (\$2.99 for the full version) in the Android Market not only defrags our phone's random-access memory, it also repairs data leaks from damaged apps. we can only run a memory boost every 10 minutes.

But if we want to keep track of just how much RAM we retrieve each boost set the apps to send a notification when new adjustments are complete. For a truly superlative uptick in performance, set the boost level to ultimate (available in paid version only).

1. Launch the app.
2. Tap the menu button.

3. Choose ultimate boost.
4. Select boost level manager.

## CONCLUSION

Android development is not a simple nut to crack. Just getting an app to run on thousands of devices is a challenge in and of itself. More than just running, our customers expect us through the performance issues that Android developers face, how to test for these issues, and how to resolve them. As our application becomes faster and more streamlined, we'll find that our customers become more engaged and leave better reviews for our application.

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